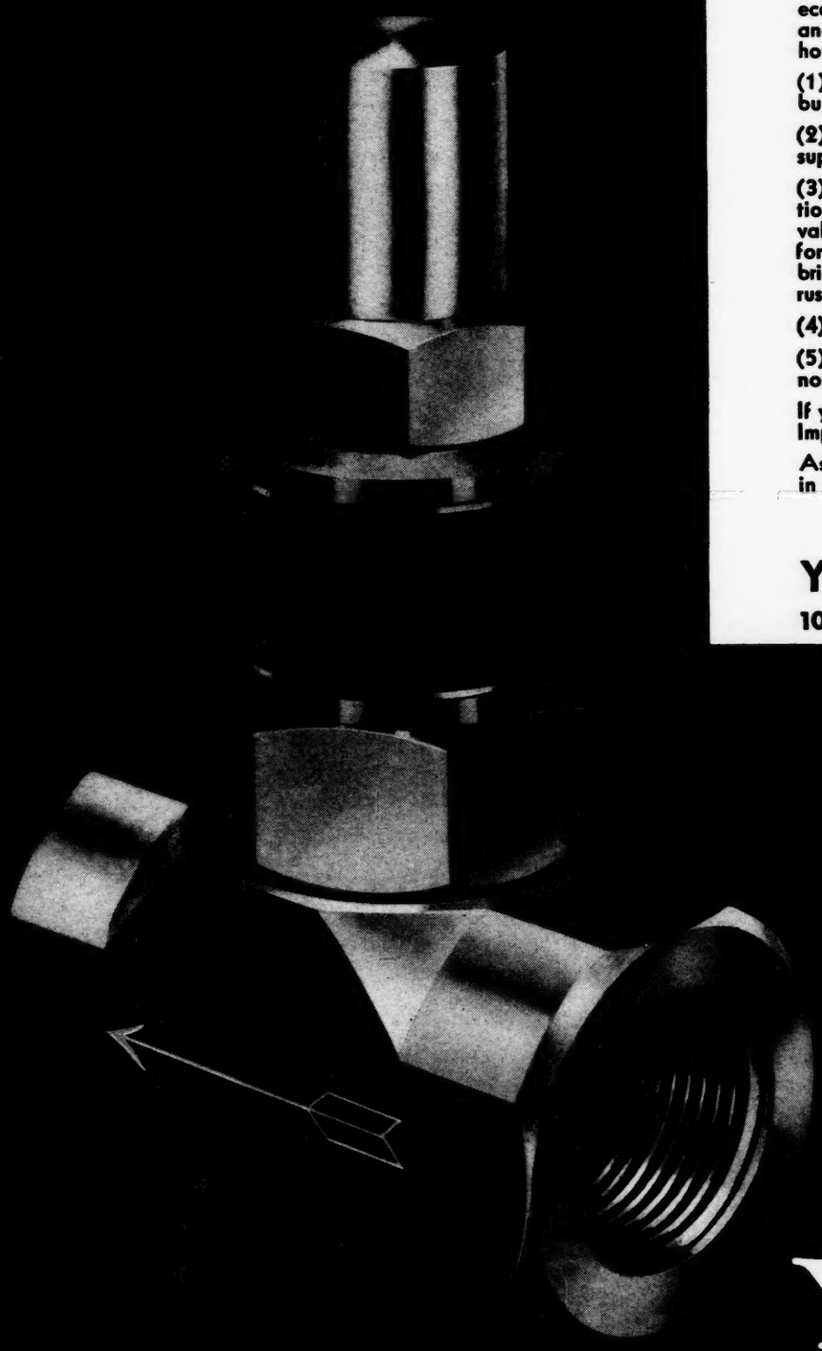
REPUBLIC
STEEL



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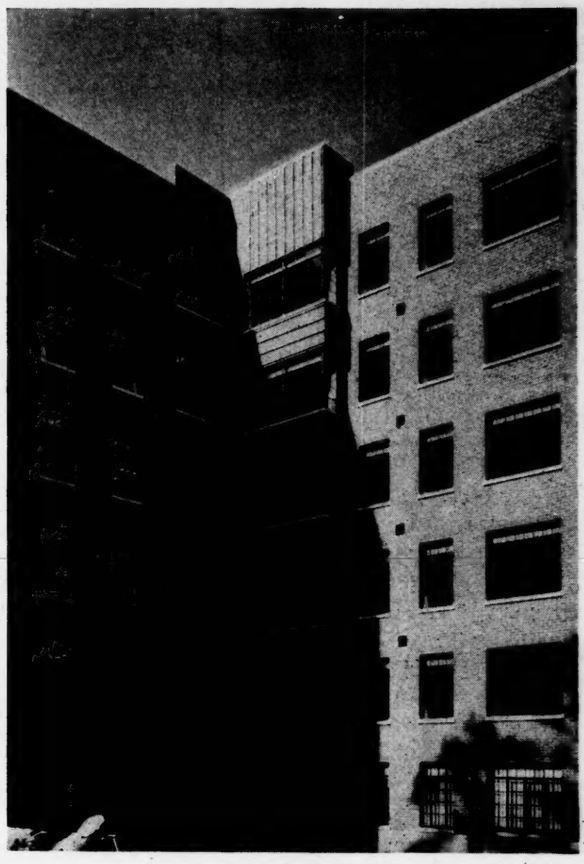


A partial view of the exterior of the Parklake Apartments. Note the outside air inlets between each floor.

A BUILDING project which has been under construction since early in 1937 and is said to be the first apartment group in the world to feature individually gas heated and air conditioned suites, has been completed in Boston, with some of the suites already occupied. It is known as the Parklake Apartments and is located in the accessible Chestnut Hill district, overlooking the Chestnut Hill reservoir lakes. There are 151 apartments in the building, which is constructed of Harvard red brick, with limestone and granite trimmings. With dependence on a central heating system eliminated, tenants enjoy the advantages of an individual home, with continuous hot water, janitor service, and automatic elevators. Gas equipment is used throughout, for heating, air conditioning, cooking, refrigeration, and steam heating of the corridors and stairwells.

The building has five floors and a ground level basement, with three sizes of apartments—1½, 2½, and 3½ rooms. Most of the foyers have a step-down to the living room. Standard equipment includes built-in clothes hampers, Venetian blinds, and radio connections in each suite from a master built-in radio antenna on the roof.

Each individual apartment has a vertical forced air conditioner for winter conditioning. These units have an input rating of 75,000 B.t.u. per hr., with the actual input adjusted to the size of each apartment, ranging from 30,000 to 67,000 B.t.u. per hr. Similarly, the amount of air circulated varies with the size of the apartment, ranging from 380 c.f.m. for the small apartments to 750 c.f.m. for the large ones. Dimensions of the heating unit are 23 x 23 x 85 in. and the net weight is 410 lb. Each unit is equipped with a pan type humidifier and filter. The filter is inserted in a special base underneath the unit.

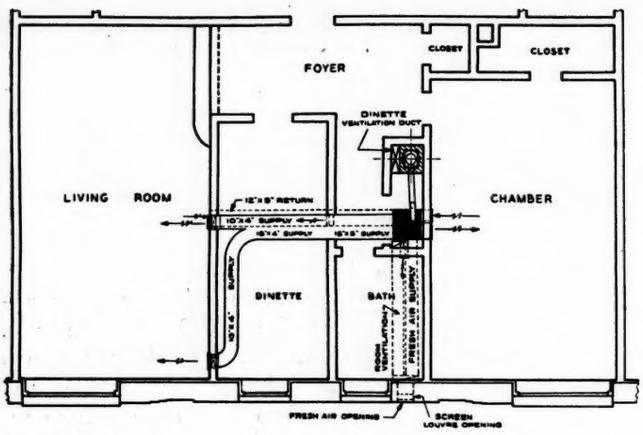
Layout of the heating system in a typical apartment is indicated substantially as installed on the accompanying plan. Each unit is placed in a heater room approximately 2 x 4 ft. in area. Most of these heater rooms are located alongside the kitchen within the apartment, a few, however, being located outside. Vertical flues consisting of 8-in. glazed bell and spigot sewer tile are installed adjacent to the heater rooms with 8 x 4 in. tees at each of the six floors for receiving the flue connection from the heater. The kitchen ventilating ducts are located alongside each chimney.

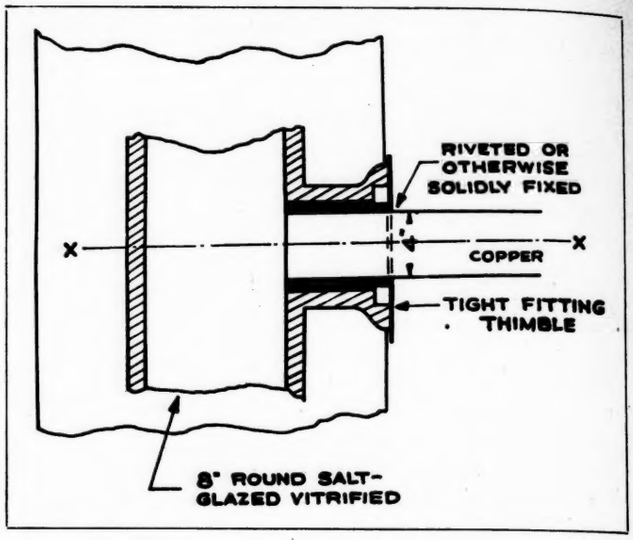
Ductwork in the apartment rooms is the standard warm air type, with two individual ducts from outside the building to the heater room of each suite. One duct supplies air for combustion and the other outside air for the circulating system. All air supply ducts are equipped with dampers for balancing the flow of air within the apartment. Supply grilles are located 6½ ft. from the floor and return grilles in the baseboard. They are of the five-direction flow type. Approximately four tons of ductwork were required for the entire building, which has 16 suites on the ground floor with 27 suites on each of the five upper floors. Fresh air intakes are located in the outside walls of the building, but are inconspicuous.

The conditioning unit was specially designed for this building as a space saver, and is enclosed so that it is tamperproof. During operation of the heater, air enters from the return air duct at the bottom of the heater, is drawn through the filter and forced upward by means of a blower, passes through and around chrome-alloy heat exchanger tubes, past the humidifier and then is discharged into the warm air duct at the top. A thermostat in the living room permits complete control of temperature by the tenant. Humidifying, however, is entirely automatic. Volume of humidification is controlled by the water level in the pan. During the summer the air circulation unit can be operated alone to provide fresh air from the outside. A switch enables the tenant to use manual control.

Corridors, lobbies, and stairwells are heated by direct cast-iron steam radiators supplied by two

The new Parklake apartment house in Boston has individual gas-fired air conditioners, one in each apartment. These units heat, clean, and humidify. A central plant provides hot water and heat for service space. The building has gas equipment throughout for cooling and refrigeration as well as heating.





(Above) Heating layout of typical apartment. The air conditioning unit is shown in solid black. (Right) Detail of flue connection from unit to glazed tile flue.

gas fired boilers, one at each end of the building, which also supply steam for the domestic hot water system through 600-gal. indirect storage tanks equipped with coils rated at 300 gal. per hr. each.

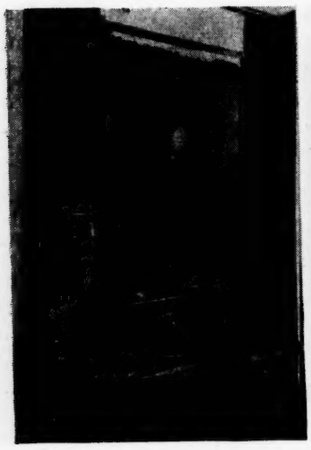
The entire building has a total cubage of approximately 1,750,000 cu. ft. and a floor area of 137,400 sq. ft. There is a total of 504 rooms in the 151 apartments, the area of a 1½-room apartment being about 500 sq. ft., of a 2½-room apartment about 800, and of the 3½-room apartments about 1000 sq. ft. each. Ten per cent of outside air, with 90% recirculated, is supplied during the heating season. Adjustment is made for taking in much larger volumes of fresh air in summer, through the fan ventilation equipment.

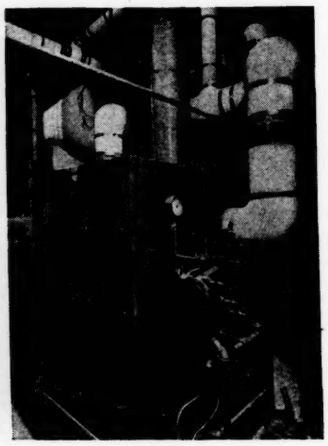
Architectural developments in the building, patterned after successful European models, with neo-angle windows, but withal thoroughly American, and set-back sections front and back in the letter E form to give equal light to all apartments, front and back, are in harmony with the surroundings of the location, in a small grove of trees, overlooking a lake and parkway.

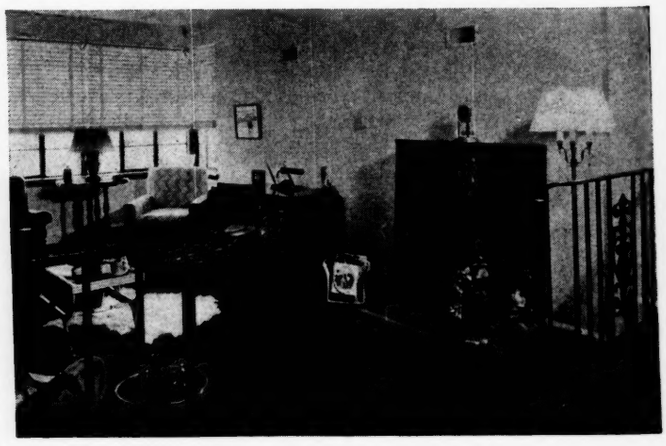
Gas for all purposes, heating, air conditioning, cooking and refrigeration, is a part of the rental charge. Total estimated annual gas consumption is 37 million cu. ft., allowing 5 million cu. ft. for ranges and refrigerators, 6 million cu. ft. for hot water service, and 26 million cu. ft. for heating and air conditioning. Estimated amount for heating takes into account some anticipated saving by the use of individual heaters as compared with a central heating plant. This type of installation is expected to permit a further saving in the cost of heating apartments that may be idle and unoccupied.

According to E. H. Bird, vice-president of Eastern Gas & Fuel Associates, it is estimated that at the now existing house heating rate of the Boston Consolidated Gas Company (50 cents per 1000 cu. ft. after the first 10,000 cu. ft.), the additional cost of operating this system, as compared with a central oil-fired two-pipe steam system, will be approximately $5000 annually. This is after crediting the house-heating cost for the lower price at which gas will be purchased for cooking and refrigeration as compared with the regular domestic rate. This amounts in added cost to about $3 per suite per month, or about 4% of the estimated average rental.

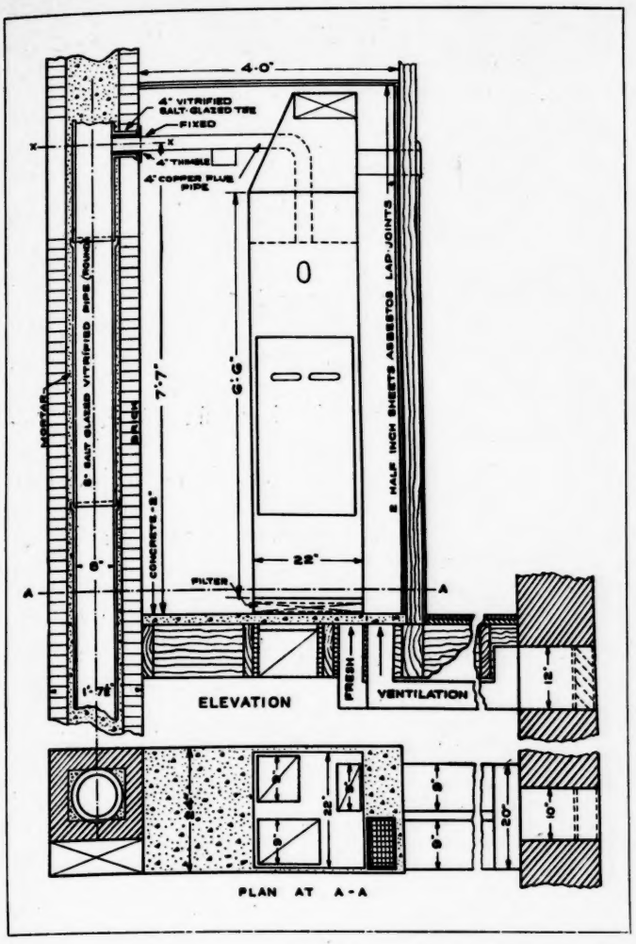
The sponsors also believe that the installation cost of this system will not be more than 20% above the cost of a standard two-pipe system with concealed radiators, and that it may run less than that. Higher cost of the separate heating units is largely offset by the



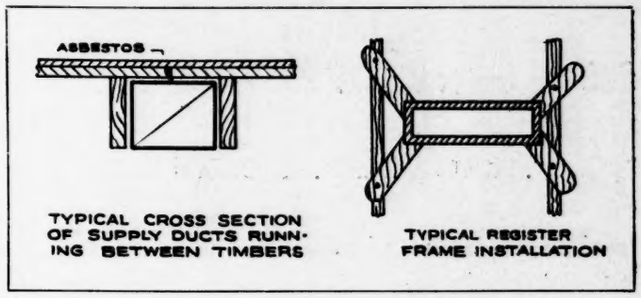




(Left) One of the 151 gas-fired air conditioning units shown in place. (Center) One of the two gas-fired steam boilers for heating lobbies, corridors, and stairwells and for supplying domestic hot water. (Right) Interior of living room of typical apartment. The supply grilles are shown on the wall while the thermostat is between the desk and the bookcase. A return grille not shown is behind the desk.



(Left) Detailed elevation and plan of the air conditioning unit and its connections. (Below) Heating details.



lower cost of the ductwork as compared with piping and radiators. Including possible fixed charges it is expected that the additional total cost to the apartment house owner will not exceed $3.50 per suite per month.

Layout of the building is in the form of an E, dividing the building into three sections. One 6-in. gas service is located in each end section, each service supplying one end section and half of the center section. In each end section four master meters are installed, two for heating gas and two for domestic gas. The gas piping is divided into two systems, one for domestic uses and the other for heating water and heating the building. This provides an extra meter at each end in times of removal. There are also two meters for sub-metering the gas used for hot water service and lobby heating. Feeder pipes rise directly to the roof on the underside and then continue around the building. From these two pipes run down for each tier of apartments, for domestic gas and for the heaters separately. In the heater rooms a connection controlled by a gas cock is taken off from each supply.

The building is owned by the Business Realty Co.; architect, Saul Moffie; heating engineer, C. H. Cummings; general heating contractor, Industrial Appliance Co. of New England; sub-contractor on steam radiators and gas boilers, P. A. Dolan Co.; air conditioning systems and ductwork, C. P. Blouin Co.

Carbon Monoxide in Foundries

PERSONS conversant with foundry operations are familiar with what is known as the "gassing stage" which follows the pouring of molten metal into sand molds. During this stage, tongues of flame may be seen shooting out from the sides of the molds, and smoke and irritating fumes are given off in considerable quantities. Air analyses have shown that where such smoke is due to the sea coal, or pitch used in the mold, sulphur dioxide may also be present.

In view of the number of organic materials used in conjunction with the sand in foundry work and the high temperatures at which the metals are poured, the question arose as to whether or not carbon monoxide might also be present during the "gassing stage" of the molds. A report of an investigation in 12 foundries appeared in a recent issue of "The Industrial Bulletin."

Air tests were made, to this end, in 12 foundries—during the pouring of ferrous and non-ferrous metals. Carbon monoxide was found in varying amounts from 0.4 to 8.0 parts per 10,000 immediately above the molds and 0.2 to 4.8 parts per 10,000 at breathing level.

The production of carbon monoxide was definitely traced to three main sources: (1) Pitch (powdered coal tar residue) used in dry sand molding; (2) sea coal (a finely powdered soft coal) used as a facing; and (3) the organic core binding materials.

The pitch gave off the greatest amounts of carbon monoxide gas; the sea coal somewhat less, and only relatively small amounts were released from the core binding materials.

The report made the following recommendations:

1. Where there is excessive exposure to carbon monoxide, smoke or irritating gases during the "gassing" of molds following pouring operations, adequate provisions should be made for the removal of all such noxious fumes.

2. Where conveyors are used for carrying molds to be poured, weight shifters should be especially protected because of their continual proximity to the gases which are given off.

3. Cores, which when hot, give off irritating fumes should not be removed from the core ovens until they are thoroughly cooled off. If, due to the nature of the working conditions, this is impracticable, other core binding materials of less irritating nature should be substituted.

Methods of Installing Orifices at Radiator Inlets

By R. M. NEE† and C. O. RADDEN†

OPERATING men in charge of heating systems in the larger buildings are aware of the lack of uniformity of heating which often obtains. This unbalanced condition is corrected to some extent by the tenants themselves. Those who are being overheated will either shut off radiators or open windows, with a resultant waste of heat. The underheated tenant will call for steam and, if satisfied, will cause further discomfort to the overheated tenant.

†Engineering and Utilization Division, Steam Heating Dept., Boston Edison Co.

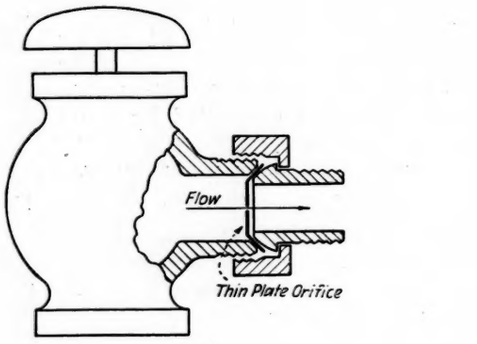


Fig. 1

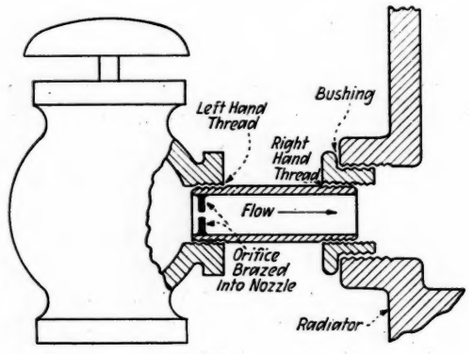


Fig. 2

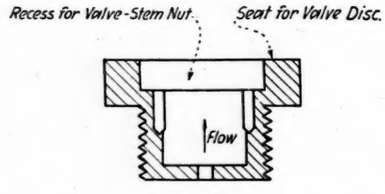


Fig. 3

If the building engineer attempts to balance his system he is often forced to install larger or smaller radiators in the troublesome rooms. These changes are often accompanied by large labor and material costs.

Another solution for the building engineer is to install a restricting orifice in the inlet to the radiator and thereby supply to each radiator only as much steam as is required. The usual practice is to fix this restricting orifice in place between the faces of the union of the radiator valve. As shown in Fig. 1, the orifice is usually dished so that it is self-centering in the union. Here the total cost for installation may be as low as 10c or 15c per radiator.

However, this is not always the solution, for in some of the older buildings radiator valves are found to be installed without unions. Instead, right and left nipples or couplings, sometimes located between the floors, are used to install the radiator valves.

In order to orifice a radiator so installed, the radiator valve had to be removed and be replaced with a new valve with a proprietary union. This change required the services of a pipe fitter as well as the purchase of a new valve. The change-over cost would average about five dollars.

In some instances the saving in steam consumption due to orifice installation would not warrant so large an expenditure per radiator. In order to find a more profitable means of fixing these radiator orifices in place, we experimented with various methods and finally found a satisfactory solution.

The scene of much of our effort was a hotel where we had been attempting to reduce steam heating bills and where the heating system was unbalanced to a considerable extent. Although we were aware of the weakened condition of this heating system's piping and of the fact that three-quarters of the radiator valves did not have unions, we felt that we could attempt this installation and let the experience serve as a guide to similar problems which exist for us.

The situation was complicated by the hotel manager's refusal to let us work on the piping because of its antiquated condition. His fear of leaks made it impossible for us to install nipples and unions where that might have been possible. Even with his permission, however, we could not install nipples and unions in most of the radiators since the outlet base of the radiator valve was between one and two inches from the radiator inlet bushing. Another limiting factor of this orifice installation was the ease with which we could do the work, since installation had to be made without disturbing hotel guests.

Because we were not allowed to work on the piping, we were forced to discard one of our proposed methods. Our procedure would have been:

1. To cut out the nipple between the radiator valve and the radiator.

2. To cut a left-hand thread in the radiator inlet bushing.

3. To install a right and left nipple into one end of which would be brazed a brass disc with the desired orifice. Fig. 2 shows a section through an installation of this type.

The advantages of such an installation are that the handwheel of the valve could still be used to control the steam flow to the radiator, that the nipple could be installed or removed while steam was on the building, and that the installation would be extremely rigid and foolproof. The cost in the building under consideration would be about one dollar per radiator for this job.

In spite of these advantages, in this instance the installation was not practicable since the piping would be disturbed, the guests were likely to be annoyed by the necessarily noisy pipe fitting, and the labor cost for installation would be high.

Another manner of fixing these radiator orifices in place then had to be devised. We had a machinist make up from brass rod a plug that could be screwed into the valve seat after a thread had been cut into the seat. This plug was made up with a fine thread since a fine thread could be more easily tapped by hand on the inside of the valve seat. In addition, a large number of fine threads would lessen the danger of stripping the thread during cutting as well as decrease the possibility of steam leakage by the plug. As shown on Fig. 3, the orifice plug was made up with 24 threads to the inch and with a shoulder cut to rest on the old valve seat. A bearing surface parallel to the shoulder formed a new seat for the valve disc. A recess, flat on the bottom, was cut into the plug through which the orifice can be drilled. Two holes were drilled at the periphery of the recess to take a screw driver and a slightly wider recess was cut at the top of the plug to receive the nut on the valve disc.

This plug has the following advantages:

1. The steam can be shut off to the radiator.
2. The plug can be removed by simply taking off the valve bonnet and unscrewing the plug.
3. The installation is rigid and leakproof.
4. The labor cost is less than for the right and left nipple installation.

Apparently this was the solution to our problem. The hotel manager and his engineer approved of this method. However, we felt that because of the necessity of tapping a thread and injuring the valve seat slightly and because of the cost, approximately fifty cents per radiator, we could find a means of doing the job that would be less dependent on skilled labor and where the cost of the orifice itself would be less. Utilizing the same idea of having an orifice that would form a new valve seat and have the other above mentioned advantages, we conceived a thin-walled pan-shaped plug that could be expanded into place. This plug is shown on Fig. 4 as it looks before installation. Fig. 5 shows the orifice plug expanded into place.

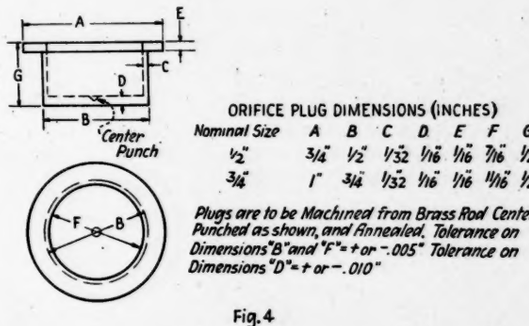
The portion of the orifice that fits within the valve seat is extended enough below the valve seat so that the metal can be expanded to form a shoulder against the bottom side of the valve seat and hold the orifice rigidly in place.

This type of orifice was tested by us in the laboratory with pipe cement used to make a tight joint. A plug without the orifice drilled through it was subjected to 25 lb. of steam pressure without being dislodged or permitting steam to leak by the valve seat.

Methods of installing orifices at the inlets of radiators in existing buildings are always of interest because they are a recognized device for controlling steam distribution. Here the authors describe their experiences in devising suitable methods to meet conditions encountered in a Boston hotel. Their final method was both ingenious and economical.

The cost for this orifice, in lots of 250, was 8c each for the ½-in. nominal size. The cost for installation, since it was done by the hotel engineering staff, is difficult to determine. However, the installation may be made in the short time it takes to remove the valve bonnet, make a few turns of the expanding tool, remove the tool, and replace the bonnet. A contributing factor to the small cost of installation is that no mechanical skill is required for these operations.

The tool used to expand this orifice in place was made up by our machine shop from hexagonal tool steel rod. The expander, as shown on Fig. 6, is slotted somewhat



ORIFICE PLUG DIMENSIONS (INCHES)

Nominal Size	A	B	C	D	E	F	G
½"	3/4"	½"	1/32"	1/16"	1/16"	7/16"	½"
3/4"	1"	3/4"	1/32"	1/16"	1/16"	11/16"	½"

Plugs are to be Machined from Brass Rod Center-Punched as shown, and Annealed. Tolerance on Dimensions "B" and "F" = + or − .005" Tolerance on Dimensions "D" = + or − .010"

Fig. 4

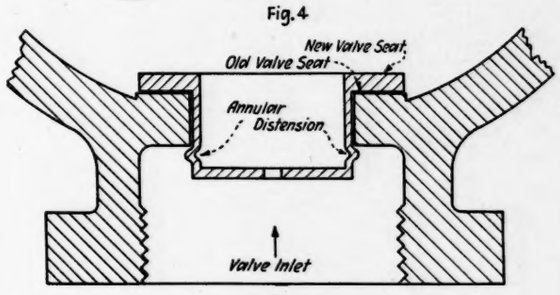


Fig. 5

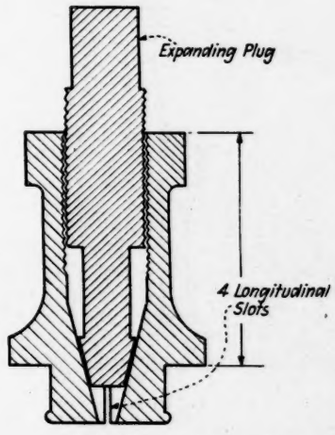


Fig. 6

like a lathe collet and threaded internally to take a tapered expanding plug. The plug is screwed into the expander, spreading the bottom of the slotted portion of the tool and pressing the brass outward to form the shoulder on the orifice plug. As the tapered expanding plug is withdrawn, the tool resumes its normal position and may be withdrawn from the valve body.

After this orifice and tool had been developed, the manufacturer of a radiator valve with an incorporated orifice suggested that our type of orifice would prove noisy in operation. It was his contention that the water of condensation would gather in the cup of the orifice plug with the result that there would be gurgling or other noises when steam was turned on. Although we tested this orifice in a radiator under typical conditions we were not able to detect such noises.

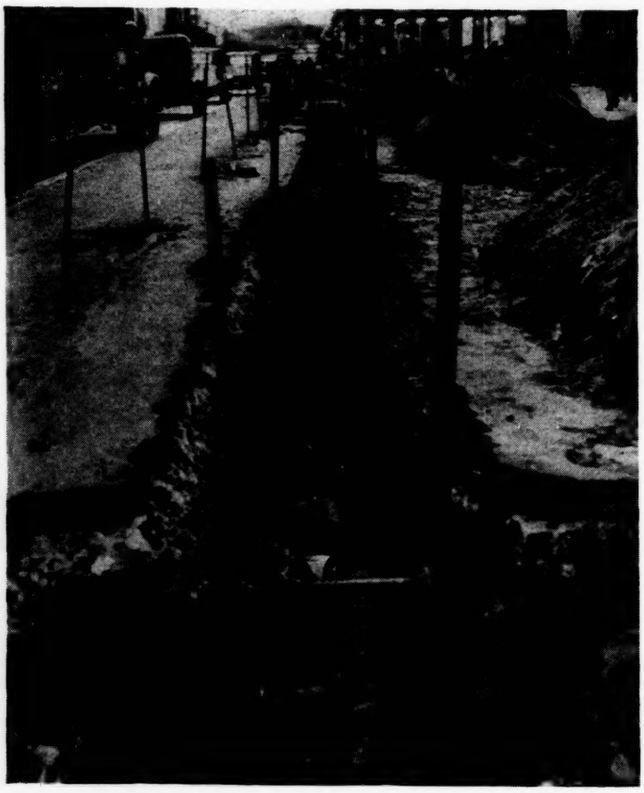
Having made what we believe to be a thorough investigation, we feel that this last method will prove a satisfactory solution. The hotel installation has not yet had the test of a season's operation but we expect it to prove satisfactory. The ease of installation by unskilled labor, the low material cost, the avoiding of injury to valve or valve seat are all economical justification of the use of this orifice.

Chicago Lays New Water Mains to Meet Air Conditioning Needs

FACED with heavy demands for water for use in connection with air conditioning in the downtown shopping district, Chicago is laying new 16-in. cast iron mains.

Just now the focal point of this expansion is on State Street, center of one of the world's largest shopping areas, where merchants have been installing air conditioning apparatus on a large scale. Electric power company officials reported the loop business area, a square mile of tall buildings, had 16,328 tons of air conditioning capacity as of October 1 and they estimated approximately 40% is concentrated in six blocks.

The loop requires 47,000,000 gal. of water per day for air conditioning equipment already installed. Loran D. Gayton, city engineer, estimated this demand may skyrocket to 295,000,000 gal. per day in two decades. This much water would give the loop 102,000 tons of refrigeration, sufficient to provide air conditioning for 530,000 persons. Now the loop's mid-day population reaches an estimated peak of around 400,000.



Chicago, which leads the world in air conditioning installations, inaugurates a water main expansion program designed specially to meet the demands of comfort cooling equipment. These new 16-in. mains will feed the cooling plants of big State Street stores.

The program of laying new mains along State Street to reinforce the present system and to provide for the increased demand will remove the danger that air conditioning requirements for water might impair the supply needed for other purposes.

An abundance of water at the lowest rates in the country for air conditioning is the reason why Chicago leads all other cities in the world in the comfort cooling field. As early as 1906 a dining room of the Congress Hotel made the first cooling apparatus installation. Prior to 1933 there were only 255 installations in the city but in the next two years this number was increased 150% and by January 1, 1937 the total was almost 1400.

Chicago's water system, a far cry from what it was a century ago when lake water was peddled through the streets in tank cars and sold in gallon lots by private enterprise, supplies 1,500,000,000 gal. per day.

The city's mains range in size up to a maximum of 54 in. in diameter. Feeder mains connecting the newest Chicago pumping station with the loop distributing section are 48 in. Beneath Michigan Avenue is a 36-in. main. Paralleling it only a block away on Wabash Avenue is a 24-in. main.

On the other side of the problem is the question of disposal of used water. In cases where owners of equipment draw water from the city system, it is discharged into the regular sewerage system of the community. This is the case, too, where private well water is used. The result of this heavy discharge of additional water into the sewerage systems has in some cases, with Chicago being an outstanding example, placed so great a burden on sewerage facilities that it has become necessary to place certain limitations on further installation of water-using air conditioning plants either in the community as a whole or in certain sections of a city.

City Engineer Gayton said the amount of water discharged into Chicago sewers from condenser on a hot summer day is far greater than the volume from the heaviest rainfall in the city's history. Water backed up in sewers and flooded basements when all air conditioning installations operated at capacity and he called attention to the possible health hazards due to this.

Steam Plant Replaces Obsolete Furnace. Result:

SCHOOL HEATING COSTS CUT 76%

By W. T. SCHEPELER

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THE two-story Ashland Avenue school in Niagara Falls was erected in 1903 of brick. It is an elementary school approximately 100 ft. long by 60 ft. wide, contains 10 classrooms and has a registration of approximately 275 pupils. In the basement are the girls' and boys' lavatories and cloakrooms, a manual training room, and a shade repair room, used by the maintenance department. The furnace room and coal bins are also at this level. The first floor has four classrooms, a library, principal's office, clinic, and teachers' restroom, while on the second floor of the building six classrooms and a corridor are located.

The original heating system comprised four warm air furnaces that burned egg anthracite coal and had the outside air fed to and through them by means of a motor-driven fan, the heated air then being distributed to the various classrooms through ducts. These furnaces had become so expensive to maintain that it was necessary to cease repairs and decide on replacement either by new warm air furnaces or by a new steam heating plant.

After careful study it was decided to install a split steam and air system to heat the building; i.e., to use wall radiators to supply heat, and utilize the warm air ducts (used originally for heating the building) to furnish outside air for ventilation, this air being tempered and heated by suitable steam coils.

In the construction of the ventilating system the old fan and motor from the furnace system was used to force fresh air (drawn into the fan room through open windows) through (1) a tempering coil, capable of taking air at 0F and heating to 32F, and then (2) through a heating coil that can raise this temperature to 85F. The air then passes into a plenum chamber from which connection is made to all the original warm air ducts and then to all rooms in the building. Each duct was provided with a damper that was adjusted so as to permit 35 c.f.m. to pass to each classroom per pupil. Air leaves each room through air ducts leading to a common attic chamber and then through the roof to the atmosphere by means of ventilators. A bypass is also provided beneath the heating coils so that air can be sent to the plenum chamber without passing through the coils.

The heating equipment comprised two steel boilers, each capable of carrying two-thirds of the total load and each being equipped with blower for forced draft and grates for burning hand-fired rice anthracite. Both boilers are connected to a common steam header that splits and goes around the basement in both directions, supplying steam to all radiators and to heating coils. Low water level protectors are provided on each boiler. All radiators are hand controlled and all returns come back by gravity to a receiver and condensation pump and then into the boiler. A remote bulb temperature control, located in the plenum chamber, governs and operates a motorized steam valve supplying steam to the heating coils. This regulates and controls the temperature of the ventilating air and is the only automatic feature in this installation.

The operation of this heating system is very flexible and therefore economical. In the early spring and fall no steam need be put in the radiators at all since the heating may be done entirely by the tempering and controlled heating of the ventilating air as it passes through the coils. The radiator surface in each classroom is divided into two sections, one containing one-third of the surface required for the room, and the other containing the remaining two-thirds. Therefore, as the weather becomes colder and more heat is required than is furnished by the ventilating system, steam is turned into the smaller section. As the season progresses and still more heat is required, the small section is turned off and the larger section turned on until the entire load may be called for and both sections are turned on. This furnishes three degrees of heat control in addition to the ventilation and has resulted in substantial savings in heating costs.

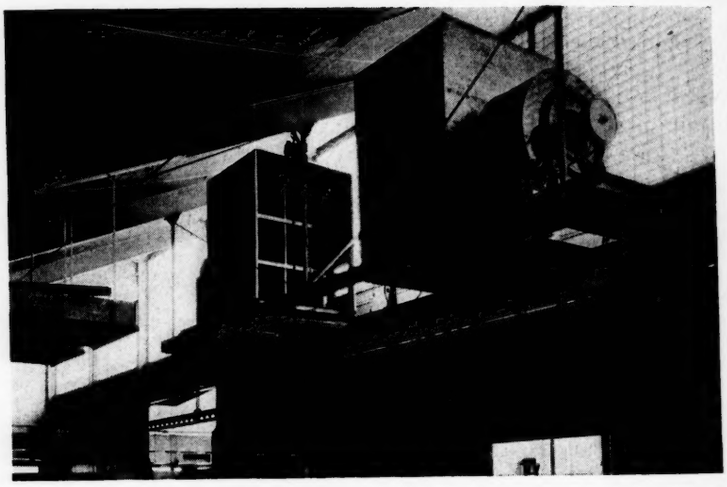
An interesting innovation, a departure from usual practice, was successfully adopted in the construction of the plenum chamber. Usually the plenum chamber is constructed of sheet metal that may or may not be lined with a heat insulating material. To prevent annoying sounds caused by metallic vibrations from being transmitted to the classrooms through the ducts, it was decided to omit the metal sheet entirely and use only the liner, in this case a well known rigid building board having a good insulating value and costing approximately six cents a square foot. This, of course, substantially reduced the cost of the plenum chamber because, in addition to the savings in cost of materials, it could be installed rapidly by a carpenter. It had been feared that dampness might cause warping with consequent leaks and other faulty results but one year of operation has been quite satisfactory.

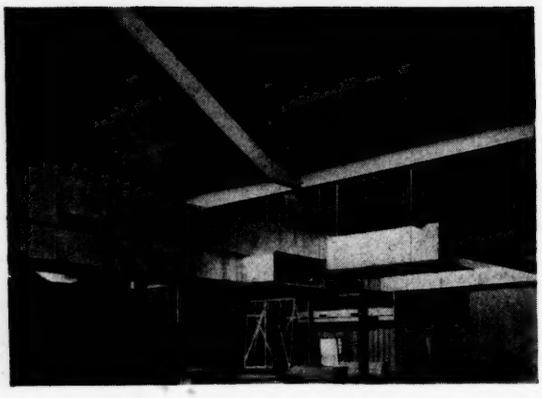
The cost of coal for the 1935-36 heating season using the old warm air furnaces was $1085 for 128 tons of egg anthracite, while during 1936-37 heating season 62.6 tons of rice anthracite were used at a cost of $255, a saving of $830 in favor of the steam heating plant.

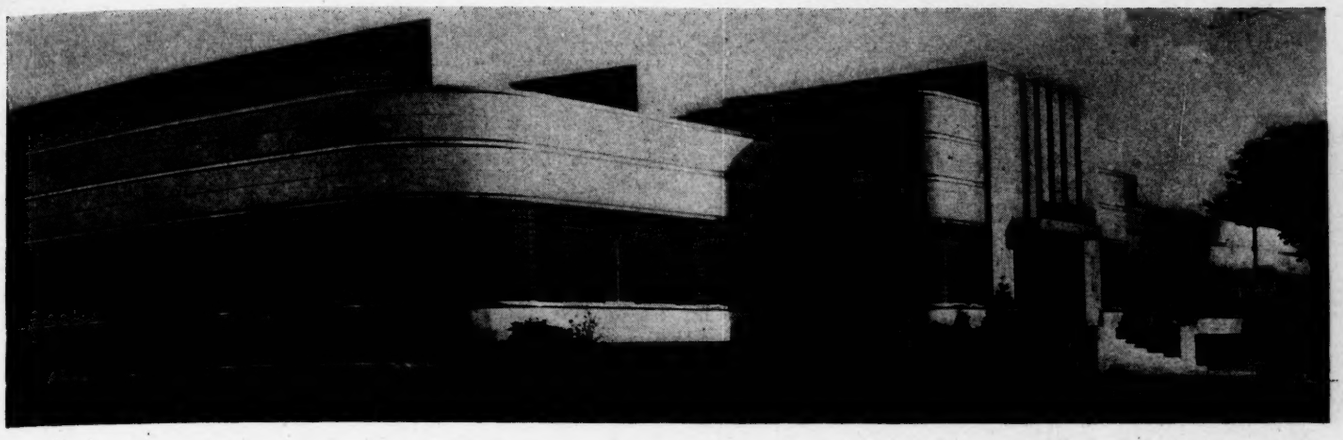
It is hoped that fuel data may be presented later on a degree-day basis.

Year-Round Conditioning in Armco Plant

The American Rolling Mill Company recently dedicated its new $280,000 streamlined research laboratory in Middletown, Ohio, with over 200 scientists from all over the country as guests. The building is tradition-breaking in design as well as in the combined application of new and old materials. Two air conditioning systems, one for the laboratories and one for the offices, provide year-round conditioning. The building, 255 x 175 ft., makes generous use of glass blocks while the wall sections are Steelox channel sections made by Steel Buildings, Inc., an Armco subsidiary. Each section has a 3-in. channel filled with an insulating material. Interior walls are covered with steel sheets. Porcelain enamel panels are used for exterior facings. Shown on this page are views of the air conditioning units and of the ductwork.







Well Water System Used for Summer Cooling

FIVE air conditioning units in The American Rolling Mill Company's new research laboratories provide zone control in a self-contained group of offices and laboratories. These are supplemented by fume and heat systems in chemical laboratories and other rooms where fumes or heat are produced by testing equipment.

In the new Armco research laboratory, illustrated on the opposite page, the office units are designed to maintain a summer dry-bulb temperature of 80F, with a relative humidity not exceeding 50%, and a winter dry-bulb temperature 70F, with a relative humidity of 30%. Because of the highly insulated wall and roof construction, the relative humidity in winter is considerably above that for the average building. In laboratory sections, where experimental furnaces are in almost constant operation, temperatures will vary slightly.

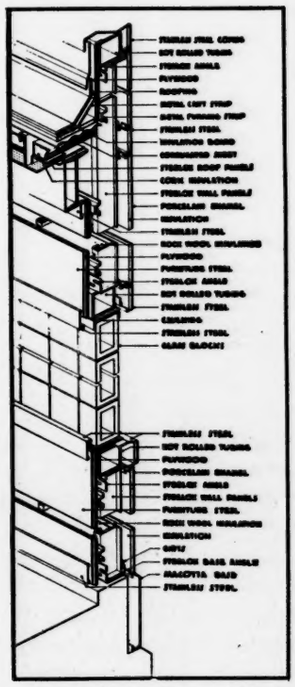
All five units are located overhead in the peaks of the saw-tooth roof, providing clearance for testing machinery and an overhead tramrail crane in the general storage aisle. Deep well water is used for summer cooling, pumped into the system at a rate of 400 g.p.m. and at 50 lb. per sq. in. pressure. Summer maximum temperature of this water will be about 60F.

Each unit has a low-speed fan, V-belt fan drive, and a squirrel cage motor. Cooling coils on all units have six rows of finned tubing designed for a test pressure of 200 lb. per sq. in., and an air velocity of not more than 450 f.p.m. over the face area of the coil. Heating coils are of the same general construction as the cooling coils. They are designed for test pressure of 150 lb.

During the cooling cycle the positions of the face and bypass damper over the cooling coil are controlled by instruments in the return air arranged to provide a high limit on dry bulb, a high limit on relative humidity and a low limit on dry bulb in the event the machine is being operated for dehumidification. The modulating damper motor is provided with an auxiliary switch, which closes the water valve supplying the cooling coil whenever the cooling bypass is in the full open position. A relay in the control circuit closes the water valve whenever the fan on its system is not in operation.

The face and bypass dampers over the heating coil are controlled by the same modulating damper motor. During the heating cycle, the auxiliary switch on the damper motor is arranged to operate the two-position steam valve on the steam line in such a manner as to close the valve whenever the heating bypass is in the full open position.

An economizer arrangement operates during the heating cycle to provide outdoor air for cooling in the event the heating apparatus is completely shut down, or the return air temperature continues to rise to a point where cooling is required. This function is provided by the second coil on the return air control instrument which modulates the outdoor air damper, and the second coil of the low limit instrument which prevents the introduction of outdoor air beyond the minimum ventilation requirement at any time the heating system is functioning. When the outdoor air damper is in the full open position, the return air damper must be in the fully closed position.



Wall section of building

Outside air intakes are set in the glass block sawtooth walls, and conditioned air is supplied to rooms through diffusing grilles placed near ceilings. In summer, warm air is circulated from rooms through grilles placed near the ceilings, and cool air in winter through grilles near the floor.

Steam for heating the laboratories is obtained from a 120 lb. per sq. in. main, and is reduced to 5 to 7 lb. to serve the air conditioning units.

At the dedication of the building Charles R. Hook, president of Armco, declared that "the real goal of industry is to find new products for old and new uses, so that as industry itself grows, more people will have the jobs and the money to buy these new conveniences. How can we achieve that goal? Research is the key, industry the force that can turn the lock."

Instruments for the Ventilating Engineer

THE ventilating engineer is frequently interested in learning the approximate concentrations of various contaminating gases in the air so that he can properly design or check the operation of exhaust systems. While exact chemical analysis can be made most of these require such an amount of equipment and time that they are not practical for the engineer. To meet the needs of ventilating and industrial safety engineers a number of instruments have been developed which will furnish fairly quick and reliable analysis of contaminating gases. A recent article by Samuel Moskowitz in the New York State Industrial Bulletin described several of these instruments and their fields of use.

Carbon Monoxide Indicator

A portable instrument which permits almost innumerable tests of CO to be made in a short space of time consists of a motor and pump to draw a stream of air, at a measured rate, through a "Hopcalite" catalyst. This catalyst permits the preferential burning of the carbon monoxide to carbon dioxide, the excess air supplying the necessary oxygen. The heat developed during this burning is directly proportional to the quantity of carbon monoxide burned. The increase in temperature due to the burning of the carbon monoxide is detected with a sensitive thermocouple which registers on a millivoltmeter which reads directly in hundredths of one per cent (parts per 10,000) of carbon monoxide in the air tested.

This instrument has been found very useful in the testing of motor truck and bus cabs, garages, automobile repair shops, gas-fired equipment, and wherever incomplete combustion of carbonaceous fuels is suspected. The facts that the indicator is portable and gives an almost instantaneous reading of the carbon monoxide content of air are its chief advantages. The instrument must, however, be calibrated against a standard chemical method for estimating carbon monoxide at various times during its use in order to insure a reasonable degree of accuracy.

Combustible Gas Indicator

Another instrument which is finding industrial use is the combustible gas indicator. This consists of a small vacuum tank whose pressure is kept below atmospheric by means of a hand-operated aspirator bulb. Air to be tested is drawn over a heated platinum filament which is one arm of a Wheatstone bridge. Combustible gas in the air is burned on the surface of the platinum filament, raising its temperature and, therefore, its electrical resistance. The increase in resistance depends upon the heat evolved during the burning and therefore on the concentration of combustible gas present. The change in electrical resistance unbalances the Wheatstone bridge and allows a flow of current to register on a galvanometer. The meter is calibrated to read directly in per cent of the lowest concentration of the combustible gas (in air) which will produce an explosion, the instrument being provided with flame arresters to prevent the setting off of the explosion by the heated filament. It has been found that a single meter calibration will suffice for all gases the product of whose molecular heat of combustion and the lower explosive limit concentration is a constant.

This instrument is most useful in testing air which contains a relatively high concentration of combustible vapors which are relatively non-toxic. Such conditions are found in mines where the chief contaminant is methane, and in tanks which had contained petroleum or petroleum distillates. Testing of the latter will indicate if it is safe for men to enter or if necessary welds can be made with safety.

Interferometer

The interferometer is a delicate optical instrument which can be used to compare the refractive indices of two specimens of gas or liquid. The refractive index of a medium is the reciprocal of the relative velocity with which light can pass through that medium, the speed of light through vacuum being taken as "1." The more concentrated a medium becomes the lower will be the speed of light through it and, therefore, the higher its refractive index. By comparing normal air with that encountered in an industrial environment, an estimate of its concentration of contaminants can be made. Unfortunately, not all impurities produce a marked change in the refractive index of air. Moreover, the instrument is non-specific: Where several contaminants are present the reading obtained is due to the combined effects of all foreign substances. Nevertheless, the largest portable instrument, having a gas chamber 50 cm. long, is valuable in industrial hygiene surveys since readings can be made quite rapidly. A large factory can be investigated and places with the highest concentrations of contaminants studied more completely with chemical methods designed for that purpose.

Other Instruments

Besides the instruments described above there are several small, inexpensive devices for the estimation of other impurities in air. One such is the hydrogen sulphide indicator. It consists of a hand-operated aspirator bulb which draws a current of air to be tested through a glass capsule containing a chemical which becomes colored when it reacts with hydrogen sulphide. The degree of discoloration is a measure of the hydrogen sulphide content of the air. A carbon monoxide indicator operating on the same principle but much less sensitive than the one previously described is also commercially procurable.

Instruments for the rapid estimation of foreign fumes and vapors in air are gaining in favor among industrial and safety engineers. Ease of operation and the rapidity with which results are obtained make these instruments convenient tools for those who try to maintain high safety standards on their premises. With proper regard for their limitations they may also be used by the chemist for more precise plant investigations.

Three Meetings and Show Held Concurrently; Physiological Studies Feature Sessions

WITH three meetings and an equipment show all being held at once, thousands had their attention drawn to New York during the week beginning January 24. The American Society of Heating and Ventilating Engineers, whose 44th annual meeting opened Tuesday, registered over 1000, including Philip E. Cox, who came from Hanoi, Tonkin, in French Indo-China, for the convention. The American Society of Refrigerating Engineers, opening its 37th annual meeting on Tuesday, drew over 350 registrants, while the National Warm Air Heating and Air Conditioning Association attracted over 300. Topping all in point of registered attendance was the Exposition where the equipment display was reviewed by over 44,000 people. These organized attractions together with unorganized social events, entertainments, and theater parties made the week a regular four-ring circus. Here is a running digest of the papers presented and a photographic record of what one out of the thousands of visitors experienced.

At the opening session of the ASHVE meeting, Tuesday morning, Walter E. Heibel, president of the New York chapter, welcomed the members to New York. Mr. Heibel recalled the early years of the Society when the New York chapter, according to the bylaws, was the host at each annual convention, and in those years, he pointed out, acting as a host was a routine matter for the chapter. However, in recent years, due to changes in the bylaws, the chapter does not frequently have the opportunity of entertaining members from other parts of the country and, consequently, the chapter is, he said, keenly alive to its pleasure in being able to entertain out-of-town members.

President Davis S. Boyden responded to Mr. Heibel's welcome and referred to the last time the Society convened in New York when the temperature was —12F, taxidrivers were on a strike, and a number of the hotels likewise had strikes.

Raymon C. Bolsinger, chairman of the membership committee, told his audience that the Society will shortly have a total membership of over three thousand. During the year 895 applications were received, 473 elected, and 447 applications are pending. The membership at the close of 1937 was 2648. The membership committee recommended the chartering of additional chapters in cities where there were enough members and interest to make this feasible, and in addition urged careful consideration of the subject of student membership.

The report of the Council was presented by A. V. Hutchinson, the Society's secretary, who reported that the Council held five meetings during 1937. He said that Hot Springs, Va., had been selected as the meeting place for the 1938 summer meeting, and Pittsburgh for the 1939 annual meeting. He reported that during the year new chapters were chartered, designated as follows: Atlanta, Golden Gate, and Iowa-Nebraska.

"Application and Economy of Steam Jet Refrigeration to Air Conditioning" was the subject of a paper by A. R. Mumford and A. A. Markson, research engineer and assistant research engineer, respectively, of the New York Steam Corporation. The paper was presented by Mr. Mumford, who showed the improvement in annual load factor of New York Steam Corporation if 10% or 20% of the space now served with heating steam could be cooled with steam jet refrigeration. The purpose of his paper was to demonstrate what air conditioning applications fall into the economical range of water vapor refrigeration; (2) to demonstrate that the steam jet should be treated as a direct process in order to obtain real operating advantages and economies; (3) to present a thermodynamic analysis of the steam jet in order to familiarize engineers with the load characteristics of these machines; (4) to discuss the fundamental practical matter of condenser water.

By means of diagrams drawn on a psychrograph the authors demonstrated that the conditions required of all air cooling installations can be met by dewpoints within the economic range of a steam jet refrigerator, most of them without reheat, and some only if reheat is provided. They showed that the influence of flash tank temperature and steam supply pressure on economy is conclusive and substantiated by performance records. They concluded that where a central station steam supply is available in Manhattan, the operating costs of steam jet are such that it cannot be disregarded in any economy setup, nor can its simplicity or its adaptability to simple control fail to appeal on an engineering basis.

Until the present time, according to the authors, concentration was stressed on the economy production of refrigeration, but in their paper the authors extended the discussion to the economic and effective use of refrigeration.

S. I. Rottmayer, mechanical engineer of the staff of Samuel R. Lewis, presented a paper on "Cooling Tower Equipment and Its Relation to Water Conservation." The paper dealt with a discussion of cooling towers for air conditioning and their characteristics, particularly in their relation to water conservation in the Chicago central business district. Mr. Rottmayer classified cooling towers as atmospheric, natural draft, mechanical draft, and evaporative condenser types, and showed how to calculate makeup water requirements and compute comparative cost data.

At the Tuesday afternoon joint session between the NWAH & ACA and ASHVE, President Boyden of the ASHVE presided and welcomed the members of the sister association.

President Rybolt responded to the welcoming address and introduced F. G. Sedgwick, chairman of the advisory committee on research for the warm air group. He pointed out that the warm air research at the University of Illinois has been under way for 20 years and over a quarter of a million dollars has been spent.

Mr. Sedgwick introduced Prof. A. P. Kratz of the University of Illinois who ably summarized the work which has been done at the University since the inception of the research project. Among the important results which he described and illustrated with charts were the heat output per square inch of leader pipe, heat loss from leaders, efficiency of the furnace at the bonnet and at the registers, effect of baseboard and sidewall registers under various outside conditions and with various types of grilles.

Necessity of Grilles

"Air Distribution from Side Wall Outlets" was the subject of a paper by Prof. D. W. Nelson and D. J. Stewart, manager of the electrical division of Barber-Colman Company. This paper, presented by Professor Nelson, dealt with the introduction of air through sidewall openings into a typical sized room. The authors presented drawings showing the air distribution along a vertical section of a room using various types of sidewall openings and showing the velocities and temperature variation and direction of the air introduced into the room. They demonstrated that some of the principal variables affecting the distribution of air other than the length of air throw are height of room, mounting height of grille, volume of air, temperature of air, velocity of air, aspect ratio, sidewall locations, location of outlet, and ceiling beams. They concluded that there is a need for an authoritative set of requirements for determining comfortable conditions within a cooled space and suggested that comfort air conditioning specifications should include a relation between the three factors of room temperature, air velocity, and the difference between the room temperature and that of the moving air. The data in their paper indicated that, for the conditions tested, a plain sidewall opening is unsatisfactory when compared with the use of grilles.

Prof. F. B. Rowley presented a paper on "Condensation Within Walls" prepared by him and A. B. Algren and C. E. Lund, all of whom are connected with the Engineering Experiment Station of the University of Minnesota. As the authors reminded their audience, the condensation of moisture in walls has been a troublesome problem with many types of construction under adverse temperature conditions due to a lack of understanding of the true nature of the problem. They pointed out that the condensation of moisture takes place when water vapor is cooled below its saturation temperature and showed how in most cases an intelligent combination of insulation and vapor barriers will eliminate any chance of trouble. They emphasized that a fundamental principle often overlooked is that a vapor barrier should be placed on the warm side and not on the cold side of a wall.

The Code of Minimum Requirements for Comfort Air Conditioning, sponsored by a joint committee of the ASHVE and ASRE of which L. A. Harding is chairman, was reported as having received a favorable mail vote from the ASHVE membership.

At the Wednesday morning session of the NWAH & ACA, F. G. Sedgwick, chairman of the advisory committee on the research program of the Association, said that tests at the Research Residence had not been entirely satisfactory during the past summer in Urbana due to the mild weather. However, temperature drop tests were completed for one size of round ducts. Work was started this fall on a study of stoker-fired furnaces and the preliminary part of which was devoted to tests on hand-fired stoker coal. These are now completed and the second part of the program—tests on stokers in the existing furnace in the residence—are being carried on. Following completion of these tests, investigation will be made of stoker-furnace units. Next summer it is hoped to have partial cooling tests run in the residence with extreme temperatures.

Following completion of the stoker tests, which may take as long as one or two years, work is contemplated on studies of the Research Residence when insulated. This will open up a whole range of heating and cooling studies which will probably yield quite different data from those obtained with the uninsulated house.

R. B. Engdahl, research assistant at the University of Illinois, presented a paper by Professor Konzo and himself on "Heat Losses and Temperature Drops in Forced Air Ducts." The temperature drop ranged from 0.4 to 2.3F per ft. of duct at a 145F initial temperature.

Mr. Engdahl pointed out that variation in the heat loss and temperature drop in forced air ducts depends on 14 variables, as follows:

1—Heat transmission coefficient of the duct; 2—temperature of the air flowing in duct; 3—temperature of the air surrounding duct; 4—area of the duct; 5—nature of surface of duct; 6—surface temperature of duct; 7—temperature of surfaces in space surrounding duct and to which the duct loses radiant heat; 8—temperature of stratified air in the duct; 9—velocity of air in the duct; 10—velocity of aid around the duct; 11—viscosity and conductivity of the air flowing; 12—whether the duct is in a horizontal or vertical position, since this affects the amount of convection; 13—degree of straightness of the duct; 14—shape and size of the duct.

House Cooling

Professor Konzo presented the next paper which was a progress report on summer cooling at the Research Residence during 1937. In these tests a small condensing unit was used for cooling and having a capacity of 17,500 B.t.u. per hr. as compared with the 30,000 B.t.u. unit used in previous tests. All tests were made on days following operation of the night attic fan.

Among the conclusions of the author were that the small unit did not give as great a dehumidification as the larger unit, but, on the other hand, it was able to maintain effective temperatures of not over 75F during the rather mild season. The indoor temperature was satisfactory on all days when the outside temperature was not over 95F. This was probably due to the fact that a small unit was forced to operate continuously whereas the larger unit had operated intermittently. The ideal installation, Professor Konzo pointed out, would be with a refrigerating machine so sized that it would be forced to run continuously, but at the same time large enough to handle heavy loads.

The speaker showed the relationship between the maximum indoor temperature and the mean daily temperature outside. Night air cooling without the use of refrigeration was satisfactory up to outside daily mean temperatures of 75F when the maximum indoor temperature was about 79F. For higher outside tempera-

ture the condensing unit was used, 75.5F being the upper limit of the mean outside temperature when night cooling could be used.

From an analysis of weather data the author concluded that night air cooling in a normal year in Urbana in the research residence is satisfactory for 108 out of 153 days requiring cooling. With night air cooling and the condenser in operation, 143 days can be satisfactorily handled, leaving only 10 days in a normal year when the small condensing unit was not sufficient to handle the load.

Attempts were also made to determine the degree of satisfaction which could be obtained with zone cooling; that is, cooling only the first floor. In general this was satisfactory, but the second floor was not comfortable and, in fact, was quite stuffy. The author mentioned in passing that calculations had shown that the heat storage of the residence had amounted to 24,000 B.t.u. per hr. for a 1F temperature rise.

Warm Air Codes

At the Wednesday afternoon session of the warm air group, with President W. L. Rybolt presiding, recent progress made in the formulation and amendment to the installation codes for warm air were reported by Prof. J. D. Hoffman. No changes were reported in the gravity warm air code, but in the technical code adopted in the spring of 1937, Professor Hoffman recommended that a paragraph be added whereby furnace sizes in intermittently-heated buildings, such as churches, be increased by from 25 to 50% over the sizes selected where the plant operates steadily. As the allowance for temperature drop in ducts in the original edition of this same code, fixed at ¼F per ft. of duct, was based on empirical data, he suggested that the recent experimental data showed that it was desirable to amend the code so that this allowance should be fixed at from ¼ to ½F per ft. of trunk and branch ducts.

A comprehensive report on "Recent Developments in the Filtration of Air" was presented by H. E. Birkholz, American Air Filter Corp., Louisville, Ky. Mr. Birkholz traced the development of air filters both as applied to warm air heating installations and as applied to industrial problems, using a variety of photographs to show the many changes which have taken place in this kind of equipment as it has undergone development. He pointed out that the question of cleaning the air is of very great importance and lamented the fact that it has not always received the attention which its importance would indicate that it deserves.

Frank E. Mehrings in his paper "Meeting Outside Competition or Comparative Values" drew a number of interesting comparisons between the existing prices of warm air furnace equipment and other items of mechanical equipment widely used in residences.

At the ASRE meeting Wednesday afternoon, with Harry D. Edwards, Union Carbide and Carbon Company, presiding, the opening paper "Heat Transfer in Ammonia Shell and Tube Brine Coolers as Affected by Operating Conditions" was presented by John C. Consley, York Ice Machinery Corporation. Mr. Consley's paper was the result of test work on brine coolers carried on for many years in his company's laboratories.

In the absence of Prof. F. G. Hechler, E. R. Queer presented their joint paper "New Insulation Studies." The authors pointed out that the choice of an insulating material for low temperatures should not be based entirely on the thermal conductivity of the dry material since many other properties of the insulating materials are also important in such applications. Among those of importance he listed: (a) compressive strength and recovery; (b) transverse strength; (c) handleability; (d) resistance to impact; (e) dimensional uniformity; (f) moisture absorption and capillarity; (g) fire resistance; (h) settling of fill materials.

In the Thermal Plant of the Engineering Experiment Station of The Pennsylvania State College the authors have conducted tests on eight varieties of insulating materials in common use to obtain at least comparative data on these several properties. Generally, the test procedure used followed the requirements laid down in Federal specifications as far as possible, although in some cases it was necessary to devise original test procedures.

Interesting among the results was the fact, clearly brought out by the authors, that the guarded electric hot plate method of determining the thermal conductivity of dry materials is not wholly satisfactory when the materials are wet. Whereas uniform and consistent results can be produced with the dry material, there is much less certainty and much less uniformity in the results when the material contained a considerable amount of moisture. The authors pointed out that this difficulty with the hot plate equipment is no doubt due essentially to the fact that the dry plate apparatus assumes a steady flow of heat which can be easily obtained with dry materials but about which there is a good deal of question when the material contains moisture.

Secretary David L. Fiske presented a most interesting summary of the trends in growth and administration of factory schools where men are trained for work in industry. It was entitled "Education in Industry." He classified factory schools into three kinds: namely, those of one to two weeks' duration and intended to train men to a knowledge of the performance of equipment; those of 4 to 10 weeks in length, wherein the instruction goes into matters of equipment performance as well as some training in load estimation; and a third type of school which might lead to an engineering degree and wherein a full curriculum for engineering study is offered. In the same way he showed that at the present time there are four types of schools intended for training men interested primarily in the distribution of equipment. Generally, these schools offer a course lasting from one to three weeks and are intended for training salesmen, field service men, or both. He pointed out also that nearly all of the important manufacturers are now offering courses of instruction in at least one kind of school, although certain of the larger manufacturers have training schools falling under practically all of the classifications.

Properties of Ammonia

As the authors, Prof. B. H. Jennings of Lehigh University, and Francis P. Shannon of the Philadelphia and Reading Coal and Iron Company, indicated in their paper "The Thermodynamics of Absorption Refrigeration," tables giving the properties of aqua-am-

monia have not been comprehensive, or generally available in English units. These authors presented tables giving the properties of water-ammonia solutions over the whole range of solution concentration and over a pressure range of 0 to 300 lb. per sq. in. They also outlined the methods whereby the values in the tables were obtained and included a statement showing the basic values on which the computations rest.

A report by Alfred Offner, treasurer, opened the Wednesday morning session of the ASHVE. Mr. Offner spoke of the fine financial condition of the Society and also made a plea to the members owing dues to pay them as soon as possible.

Air Washers Remove Bacteria

The first technical paper was entitled "Studies on Bacterial Control in Air Conditioning," by T. S. Carswell, H. K. Nason, and J. D. Fleming. Mr. Nason presented this paper, which dealt with the study of the efficiency of air washers in removing micro-organisms from circulating air. Many tests were conducted on three actual air conditioning systems, one installed in a pharmaceutical manufacturing plant; one in a theater, and one in a general office building, all located in St. Louis. The studies covered summer operation only and during this period cooling and dehumidification were the principal functions.

The authors concluded that when the air washer was operated with sterile water it possessed a certain capacity in removing micro-organisms from the air. Apparently this capacity was dependent upon the particular system and is a function of the design of the equipment.

It was also found that there is a direct relationship between the degree of microbial contamination of the air washer water and the efficiency of the air washer as an apparatus for removing micro-organisms from the air. In line with this the authors stated that as the number of micro-organisms in the water increased, the ability of the air washer to remove microbes decreased up to the point where the air washer actually added micro-organisms to the air rather than removed them. It was found that the use of a germicide, such as benzylphenol, will insure operation of the washer at the maximum removal rate for sterile water, but it does not seem to increase this removal rate beyond the sterile water rate; that is, the use of germicide concentrations higher than those required to maintain sterility in the washer water does not increase the efficiency of the air washer with respect to microbial reduction. In the discussion which followed it was brought out that air filters have the same property of removing bacteria and, in fact, are in considerable use in industrial jobs where bacteria removal is quite important.

Dr. F. K. Hick, of the University of Illinois Department of Medicine presented the next paper which was entitled "Physiologic Response of Man to Environmental Temperature," of which the authors were Drs. Hick and R. W. Keeton and Nathaniel Glickman. This study of the response of the human body to atmospheric environment was made at the Illinois Research and Education Hospital in Chicago on both normal and other hospital patients who had complaints which required hospitalization and yet had no abnormality in heat regulation.

As a result of these tests and also of previous investigations, the authors stated that the principal means of heat loss below 80F effective temperature was by the radiation of heat. This heat loss is controlled by changes in skin temperatures in the extremities. For subjects under basal conditions it was found that the point at which sweating appears is about 81F effective temperature. Because of the drop in skin temperatures of the extremities which occurs a few degrees below the 81F temperature the authors suggest that evaporation from the body surface does increase considerably at 77F effective temperature. Until the effective temperature reaches 91F no significant changes in rectal temperatures were noted under basal conditions. In these studies no attempt was made to measure the radiation capacity of the environment but the authors stated that if this factor of radiation capacity was taken into account better correlation could be expected. They stated that the effective temperature scale comes nearest to correlation with the observations reported in these investigations.

The last paper of the morning session was prepared by Dr. C. A. Mills and Dr. Cordelia Ogle. The paper was entitled "Control of Body Heat Loss Through Radiant Means" and was read by Doctor Mills. The purpose of this paper was to present the results of preliminary studies which indicate the possibility of controlling body heat loss through radiant heat channels. Some of the authors' conclusions were that human comfort and normal growth and development can be regulated with what seems apparent safety by control of body heat loss through radiant channels alone; practical feasibility of such radiant control lies in differences in radiant heat absorption and emission exhibited by various substances. Clothing materials rapidly radiate their heat to cold surfaces and fall to temperature levels well below those of surrounding hot air thus encasing the body in a cooled capsule to which it can readily lose heat. In cold air clothing readily absorbs radiant heat from heated surroundings and therefore forms a warm envelope around the body and thus slows the process of heat loss from the skin. Foil wall surfaces act as efficient passive reflectors of radiant heat, although their temperatures are always maintained at air temperature level. According to the authors, this passive behavior of foil surfaces would seem largely to obviate the need for wall insulation since the temperature of the wall surface is no longer of importance. In the discussion following, Doctor Winslow took exception to this statement and said that in all practical cases he believed that a combination of reflective and regular wall insulation would be necessary for comfort.

ASHVE-ASRE Joint Session

A joint session of the ASRE and ASHVE was held Wednesday afternoon with W. H. Carrier presiding. The first paper was by S. F. Nicoll and W. E. Zieber and dealt with "Controls for Air Conditioning Large, Medium and Small Buildings."

The purpose of this paper was to describe the basis of control selection for air conditioning and to show by means of representative diagrams the types of control systems that have been used in various installations.

(Text continued on page 36)

I am One of the 44,387

attending the Heating and Ventilating Show and I am taking in as many of the sessions at the three conventions as I can. Here is a photographic record of what I do and what I see:

1 Monday: I arrive in New York early in the morning all set for the big week and push off for the Biltmore. My biggest problem will be to plan my time so as not to miss important events. Unpack and head for registration desk where . . .

2 . . . I am given a hearty welcome by Walter Timmis, manager of American Radiator's air conditioning systems and control division and chairman of the Reception Committee, whose hospitality outdoes the traditional southern brand . . .

3 . . . I hear Prof. B. M. Wood (left) of the University o California selling Presiden Walter Heibel of the N. Y. Chap ter the idea of a 1940 meeting i San Francisco, and then . . .

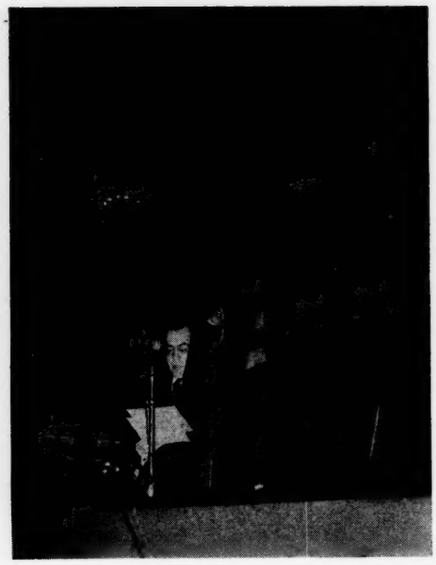
4 . . . a while later in the Roosevelt Hotel find Helen Peffer and David Fiske of ASRE headquarters preparing for their convention which begins tomorrow. Upstairs I . . .

5 . . . relax with Reid Mackin, in from Chicago for the Warm Air Convention, for an hour before preparing for the get-together dinner tonight at the Biltmore where . . .

6 . . . I enjoy an informal frolic in the Bowman Room dancing to Horace Heidt's orchestra, and hear vocalists Charles Goodman (above) and Yvonne King and others in a swell show . . .

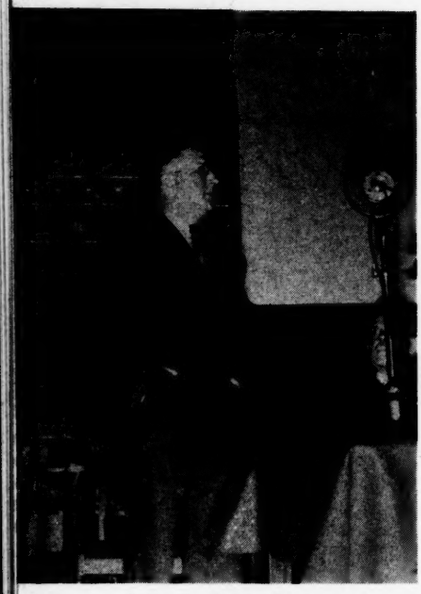
Tuesday

7 . . . I attend the first ASHVE session where president-elect Holt Gurney (left), who will be the first Canadian ever to head the Society, gravely discusses serious affairs with chairman of the finance committee J. F. McIntire preceding . . .

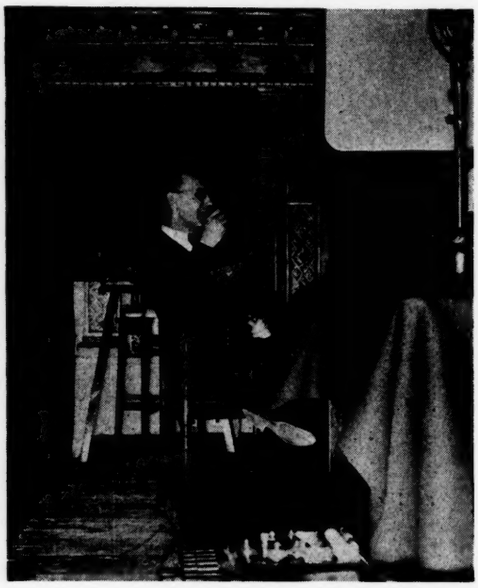


8 . . . the opening paper by A. R. Mumford of New York Steam Corp. on steam-jet refrigeration, use of which will improve the utility's load factor. Later I . . .

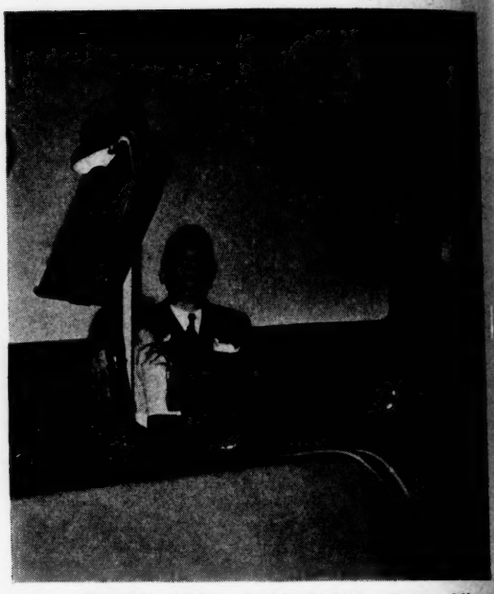
9 . . . attend the joint ASHVE-Warm Air meeting. President W. L. Rybolt of the latter group speaks briefly and introduces . . .



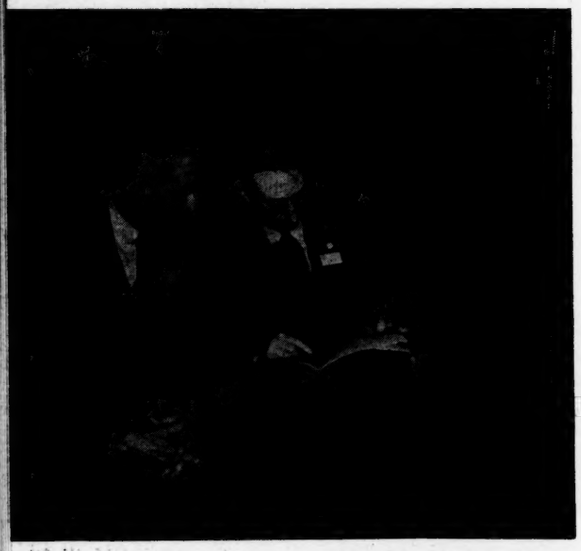
10 . . . F. G. Sedgwick, chairman of the committee in charge of warm air research at Illinois. Mr. Sedgwick calls on . . .



11 . . . Prof. Alonzo Kratz, head of the staff, who summarizes results of this 20-year old project, then relaxes with his pipe, waits for discussion . . .



12 Rybolt hides behind his cigar, Allen Williams, Managing Director, Warm Air Association, and President Boyden look on amusedly. As session ends I find . . .

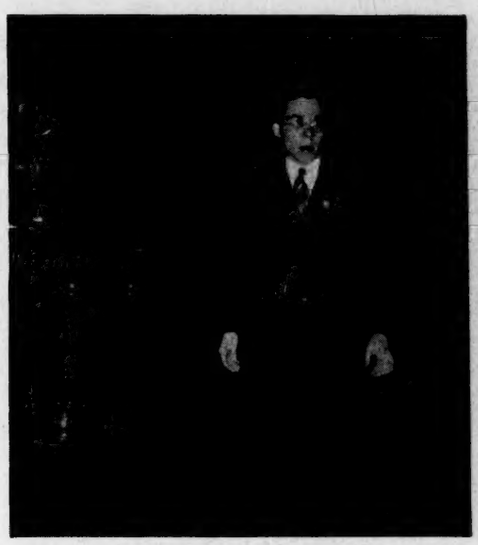


13 . . . Prof. Hoffman (left) in a lively discussion of the Warm Air Code with Fred. R. Bishop of Brundage. I get set for the show tonight . . .

14 . . . at the International Casino where I make several stops at the spiral bar, watch spellbound an elaborate show with what seems like hundreds of girls, half of whom seem to be floating around on swings through the air above our heads. As I leave I seem to be in a sort of confused state.

Wednesday

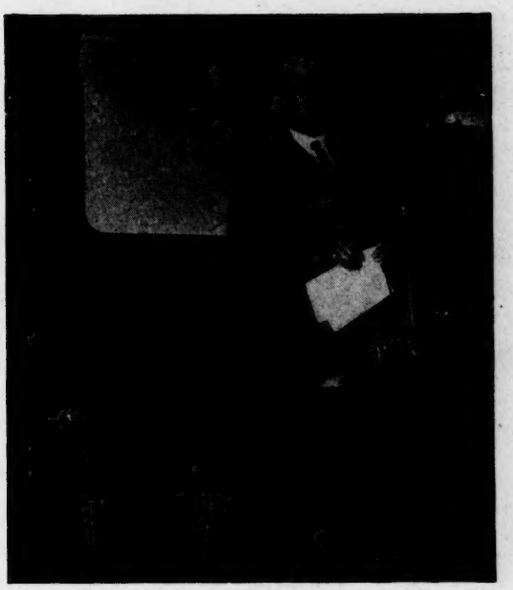
15 . . . the meeting of the Warm Air group starts late giving Prof. S. Konzo time for a chat with H. E. Birkholz of American Air Filter. Then . . .



16 . . . R. E. Engdahl, newest member of Research Residence staff, presents his first paper well and the audience and Chairman Olsen applaud . . .

17 . . . As the session ends Professor Hoffman meets one of his old students, H. G. Hayes of the Armstrong Furnace Co., while . . .

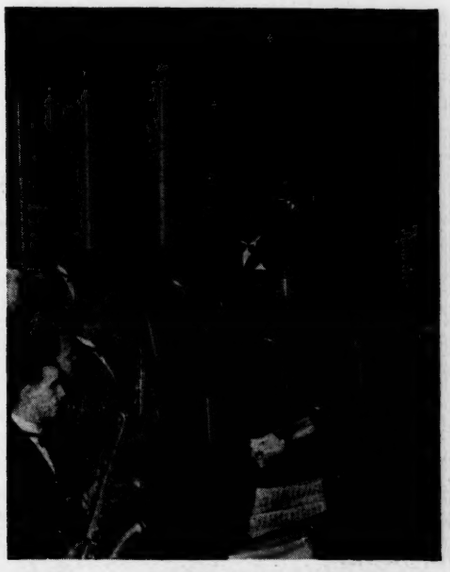
18 . . . the Warm Air Association's president-elect, Les Taylor (left) goes into the business situation with H. F. Randolph, International Heater's sales manager . . .



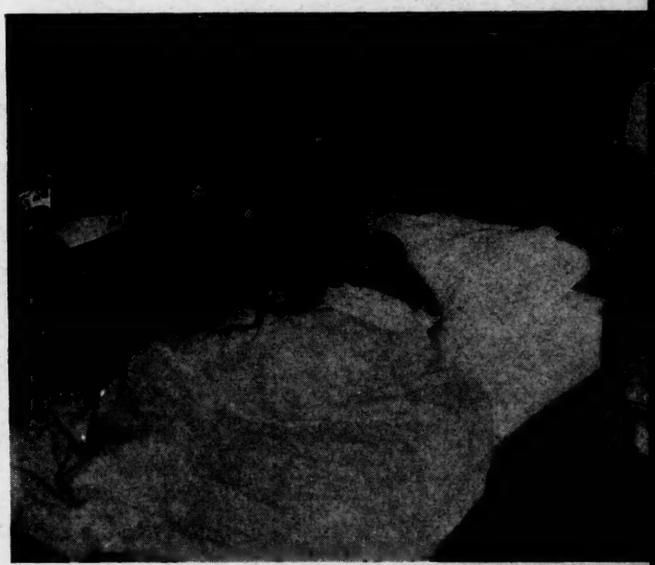
19 . . . In the afternoon a spontaneous burst of applause greets Doctor Winslow as he steps to the microphone. He describes results of physiological research under his direction at Yale and his paper . . .

20 . . . is discussed very briefly by Professor Yaglou of Harvard who expresses admiration for Doctor Winslow's work. Tests on asbestos ducts are described by . . .

21 . . . R. H. Heilman of Mellon Institute who finds errors in the existing air friction formulas. Tonight . . .

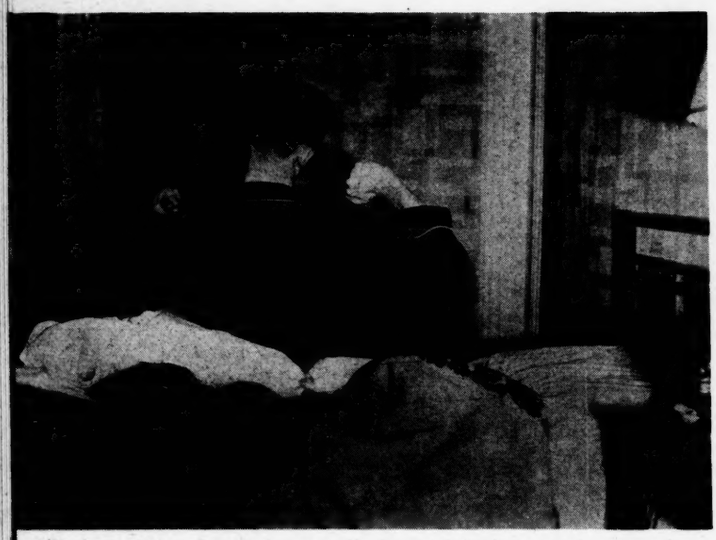


22 . . . is the night of the ASRE banquet at the Roosevelt where Guy Lombardo (standing) peddles sweet music. I am plenty tired after three nights out and . . .

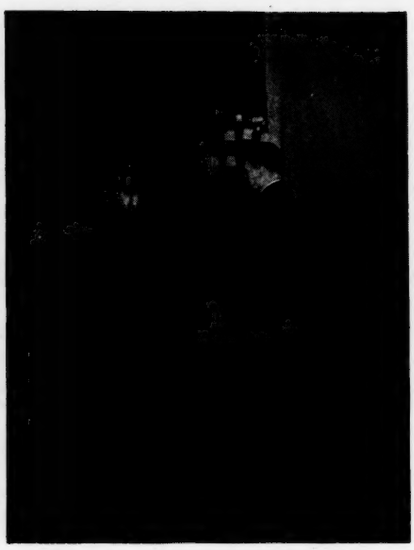


23 . . . hit the hay at 1:30 contemplating an interesting day when I plan a grand tour of the 327 exhibits of the Exposition at Grand Central Palace. Only two days left, a lot to do. Have to put on a little more pressure Thursday and Friday . . .

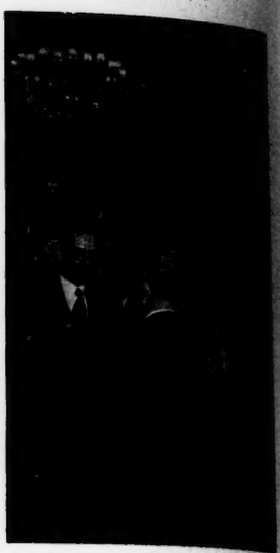
Thursday



24 . . . After I reluctantly climb out I look over the morning's program of the ASRE. I attend and find that no action will be taken on the joint air conditioning standards which ave been adopted by the ASHVE. I hear a paper on the effect f superheat on condenser efficiency, among others, and the meet-ng closes with . . .



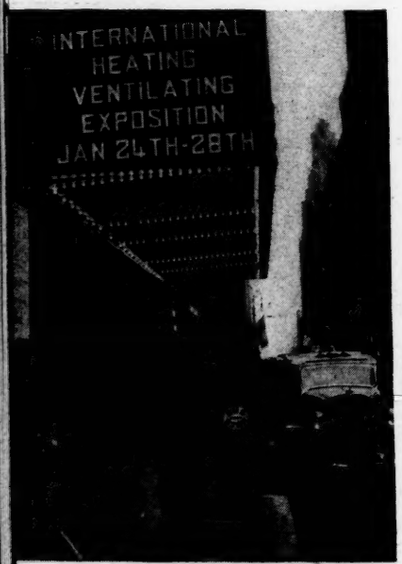
25 . . . the induction of new officers. Harry Williams, retiring president (right) presents incoming president Crosby Field with the gavel. Drifting around after the meeting I see . . .



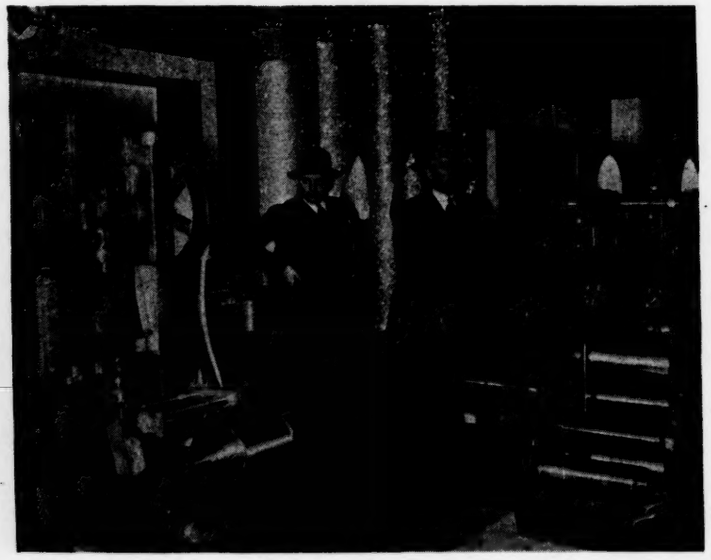
26 . . . W. F. Friend (left), of Ebasco Services, Inc., talk over his paper on refrigeration storage applied to air conditioning while . . .

27 . . . R. G. Ewer of Carbondale Division of Worthington (extreme left), Willis Carrier (center), and Secretary Fiske (right) casually converse. So far I have met manufacturers, engineers, educators, and contractors and now I am introduced to . . .

28 . . . representatives of Labor—George J. Ryan (left), member of the Heating Industry Code Committee in New York and Patrick J. Sullivan (center), Chicago, of the United Association of Journeymen Plumbers and Steamfitters, and then I . . .



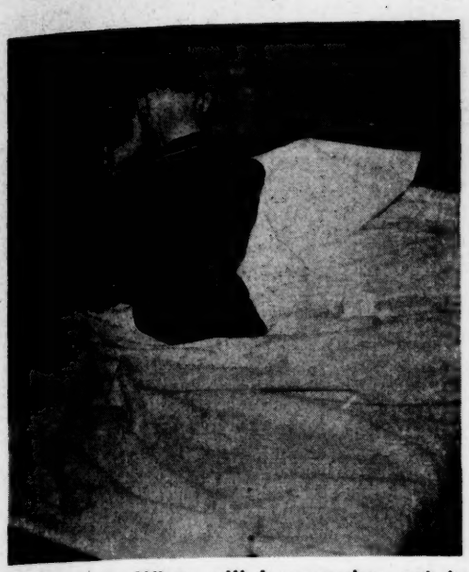
29 . . . head for the Show and arrive as the doors open. It's enjoyable but at the same ime fatiguing hiking around from ooth to booth. At the display of . . .



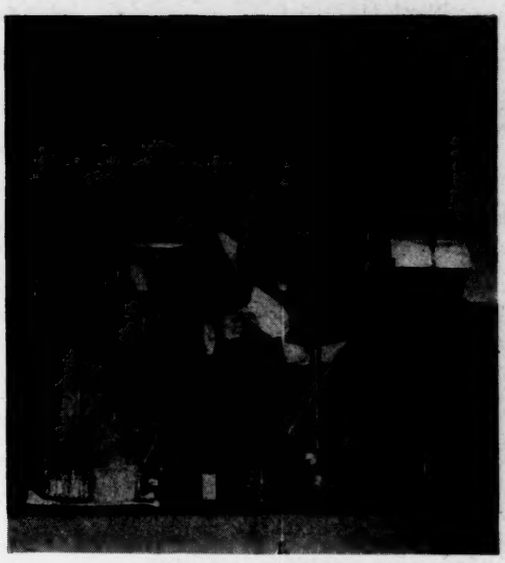
30 Youngstown Sheet and Tube, where model rolling and stamping mills are in operation turning out ashtrays for give-away, I find M. S. Curtis (right), advertising manager of the company. I continue on my way and observe one of the few women engineers in the industry . . .

31 . . . Margaret Ingalls in the Carrier booth. After five hours of looking at displays I have enough and return to the hotel . . .

Friday

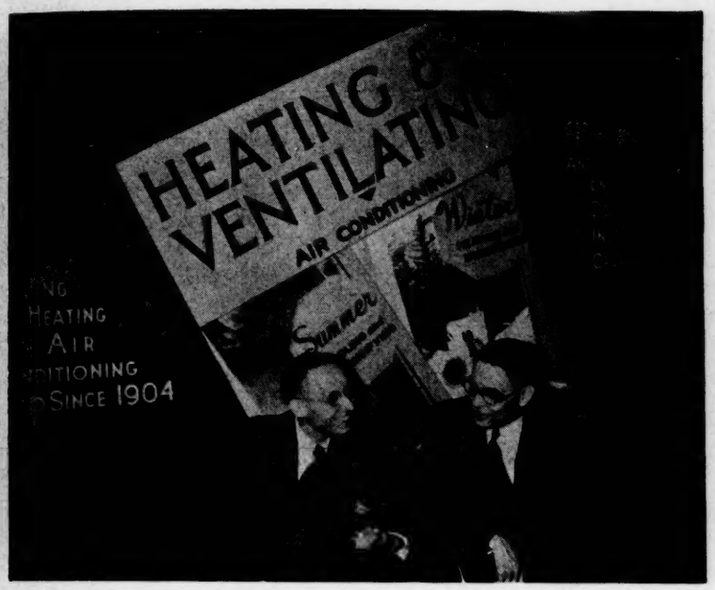


32 . . . When will I remember not to mix them? Well anyway today's the last day and I prepare for the last session at the ASHVE meeting. Here . . .

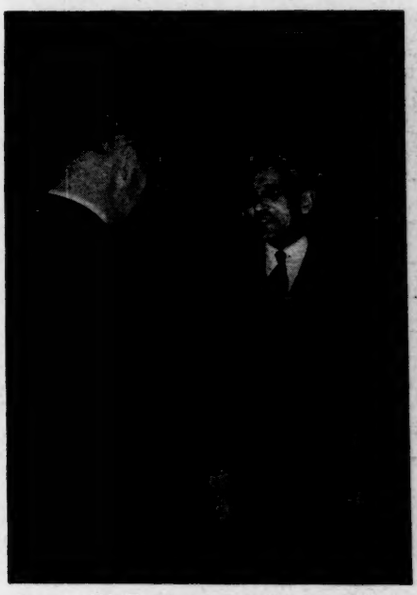


33 . . . L. J. Fowler, of London, reads greetings from the Institution of Heating and Ventilating Engineers. Afterwards I again visit the Show, where . . .

34 . . . Bill Dias of Owens-Illino New York office shows me th display of filters and glass bric As I pass by I see . . .

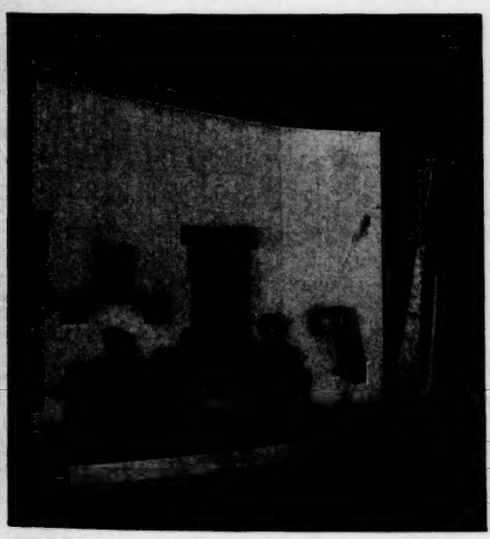


35 . . . Editor Hotchkiss (right) and Associate Editor Strock of HEATING & VENTILATING, resting in their booth and seemingly happy about the whole thing. Continuing my journey I meet a number of old friends and make some new ones. In passing I note . . .

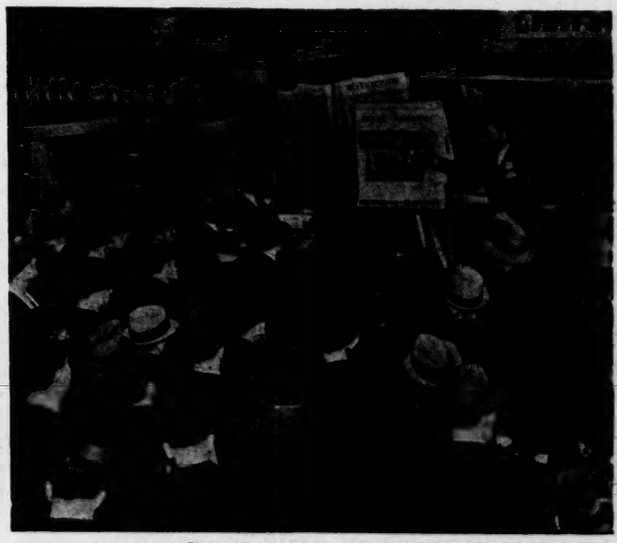


36 W. Felderman talking up Walton humidifiers. There seem to be plenty of prospects around most exhibits and exhibitors seem well satisfied. In front of a . . .

37 . . . giant bank of Fedde unit heaters, E. R. W ker (left) and Norm C. Honecker relax between quiries. Upstairs . . .



38 . . . a puppet show featuring Surface Combustion gas equipment attracts enough of us to block the aisle. The same thing seems to be happening at a number of places, including . . .



39 . . . the Chrysler Airtemp exhibit where a spellbinder lectures on the company's radial compressor. I guess he's glad the Show's almost over. I'm weary, too, and decide to call it a week, and . . .

40 . . . what a week, a leave for home, ti and weary, but enthu astic and stimulated by what have seen and heard.

The authors presented 24 of these basic diagrams. The paper dealt with applications only and not with the method of functioning of individual instruments.

Dr. C.-E. A. Winslow, director of the John B. Pierce Laboratory of Hygiene at Yale, described the results of work dealing with "Physiological Reactions and Sensations of Pleasantness Under Varying Atmospheric Conditions." Co-authors of the paper were L. P. Herrington and A. P. Gagge, both of the Laboratory staff.

Doctor Winslow's studies referred only to unclothed subjects at rest in a semi-reclining position and therefore cannot be directly compared with the results plotted on the Comfort Chart. Consequently, metabolisms are higher on the comfort charts than in Doctor Winslow's tests.

Doctor Winslow pointed out that the ASHVE standard comfort studies do not permit of a separate evaluation of the influence of radiation and it was to accomplish this that his studies were made. The authors presented graphs showing the influence of relative humidity and of air movement on reactions in the zone of evaporative regulation and in the zone of body cooling. In connection with the studies the subjects voted on their sensations of pleasantness in the zone of evaporative regulation and in the zone of body cooling and reported that the following conditions represent limits beyond which distinct sensations of unpleasantness will occur with different combinations of air and wall temperature and with air velocities of 17 and 100 lin. f.p.m.:

Air Movement	
17 f.p.m.	
Air Temp. F	Wall Temp. F
68	68
65	73
62	62
59	86
100 f.p.m.	
76	76
73	91
70	105
67	118

R. H. Heilman of the Mellon Institute of Industrial Research, and R. A. MacArthur of The Philip Carey Manufacturing Company, were the authors of a paper "Performance Tests of Asbestos Insulating Air Duct," presented by the former. The authors showed that these ducts have a coefficient of friction practically the same as metal ducts and indicated that the heat transmission of these ducts lay midway between the transmission of a plain, tarnished metal duct and one insulated with ½ in. of thick, cellular laminated asbestos paper. The tests showed that the present air velocities commonly used can be increased when using asbestos air ducts and that for all air velocities tested, the asbestos ducts were superior to metal ducts in sound attenuation. In response to questions, the authors indicated that the installed cost would be slightly higher than a plain metal duct, but less than the cost of a well insulated metal duct.

"Effects of Artificial Lighting on Air Conditioning" was the subject gone into in great detail by Walter Sturrock, illuminating enginer, General Electric, at the Thursday morning session of the ASHVE. The author's paper dealt with the effect of artificial lighting on the temperature rise which must be considered in designing the cooling system. In connection with his paper he presented a table on the recommended light intensity for a wide range of uses and gave the resulting electrical demand in watts per square foot of floor area. The author discussed the possibility of obtaining a higher utilization of light in order to cut down this part of the cooling load as well as the minimizing of the heat by the reduction of lighting in cases where more light is being provided than necessary. He showed the relation between the temperature rise in a 7-hr. period and the wattage capacity employed for lighting in two typical office spaces which illustrated the importance of natural ventilation in carrying off the heat by ventilation.

Forced ventilation to carry off lighting heat was discussed thoroughly by the author and he concluded that it is mechanically possible to install a ventilating system with air ducts to the lighting units so that as much as one-third of the total generated energy can be removed. On the other hand, if none of the energy generated by lighting is carried off by ventilation, 50 to 90% of the lighting load will eventually become a part of the cooling load. Mr. Sturrock pointed out that the cost of an elaborate auxiliary system is not justified unless the lighting load exceeds 5 watts per sq. ft. of floor area.

J. R. Hertzler, York Ice Machinery Corporation, presented a "Comparative Analysis of Office Building Air Conditioning Systems." Mr. Hertzler analyzed design and operating data on air conditioned buildings in Houston, Tex., Boston, St. Louis, Fresno, Calif., Hershey, Pa., and Wilmington, Del. He showed that the buildings analyzed had a population density varying from 64 sq. ft. of floor area per person to 142 sq. ft. of floor area per person. The maximum average lighting loads of the systems analyzed that occurred simultaneously with maximum sun effect was 2.97 watts per sq. ft. of floor area. The minimum outside air supply ranged from 0.44 changes per hour in a windowless building to 3.88 changes per hour in another building. The cubic volume per ton of calculated refrigerating load ranged from 2880 cu. ft. per ton to 6050 cu. ft. per ton.

"Ventilating the Lincoln Vehicular Tunnel" was the subject discussed by Charles W. Murdock, mechanical engineer, The Port of New York Authority. The author illustrated by drawings the general plan of the tunnel, described the ventilating system as installed, outlined the air requirements for ventilation, and devoted the remainder of his paper to a detailed description of the various parts of the ventilating and air conditioning apparatus.

The maximum rates of fresh air supply for the new tunnel, in c.f.m. per lineal foot of tunnel, were as follows:

Two-Way Traffic	
Section on upgrades	200
Level sections	225
One-Way Traffic	
Section on upgrades	275
Section on downgrades	150
Level sections	225

At the Thursday morning session of the ASRE, W. F.

Friend, mechanical engineer, Ebasco Services, Inc., presented a paper on "Refrigeration Storage Applied to Air Conditioning." In this paper the economic background of refrigeration storage, or holdover, was discussed and the author indicated why it should be given serious consideration for important installations. Data were presented on the characteristics of commercial air conditioning loads with particular reference to the cost of power supply. The author described methods for storing refrigeration and construction details for some typical installations. Procedure for determining the economic amount of storage to be provided in specific cases was suggested and some refrigeration storage systems now in operation were described.

R. H. Swart, chief engineer of General Refrigeration Corporation, presented a paper entitled "Extended Surface Cooling Units—Design Calculations" in which he presented the solution of typical examples worked out in detail involving extended surface units. Information was given in connection with solving the temperature gradient of air to the fin and from the fin to the tube; the temperature gradient between the tube and the refrigerant; and the consolidation of the temperature gradient through the fins and from the tubes to the refrigerant.

At the Friday morning session of the ASHVE, the proposed ASHVE Standard Code for Testing Stoker-Fired Steam-Heating Boilers was distributed in preprint form and a short discussion regarding it was read by C. E. Bronson, chairman of the committee. The purpose of the Code is to provide a standard method for conducting and reporting tests to determine heat efficiency and performance characteristics but not to fix the conditions that must be fulfilled for the acceptance or the approval of the boiler-stoker combination. Members of Mr. Bronson's committee are L. A. Harding, H. M. Hart, F. C. Houghten, A. J. Johnson, J. F. McIntire, D. W. Nelson, Percy Nicholls, R. A. Sherman, and E. C. Webb.

F. C. Houghten, director of the research laboratory presented the results of laboratory tests on "Draft Temperatures and Velocities in Relation to Skin Temperature and Feeling of Warmth"; co-authors of this paper are Carl Gutberlet and Edward Witkowski. Tests were conducted on individuals and skin temperatures taken when drafts were directed at the subjects' necks and ankles. An arbitrary index of comfort was used and the subject was asked to evaluate the feeling of comfort under the test conditions. The study showed that there is a definite relation between the drop in skin temperature of the ankle and neck and the temperature and velocity of a draft of air striking these parts. For the same change in air temperature and velocity, a greater change in skin temperature is indicated for the neck and a considerably higher draft velocity and lower draft temperature are indicated as possible for the ankle than for the neck.

Prof. S. Konzo of the University of Illinois presented a paper by Prof. A. P. Kratz and himself entitled "Study of Methods of Control and Types of Registers as Affecting Temperature Variations in the Research Residence." This investigation was conducted to study some of the factors which affect the cyclical variations in temperature accompanying the operation of a forced-air heating system especially under low outside temperatures and to isolate the factors which affect the temperature difference between the breathing level and floor level.

Tests on the method of control showed that more frequent cyclical operation of the fan tended to reduce the length of off-periods of the fan and consequently reduced the temperature variation in the living zone.

The authors investigated the performance characteristics of a forced-air system using a two-speed fan which operated at a low speed during the greater part of the heating season and at high speed during cold weather only. This required a more expensive motor and a more complicated control than a single-speed fan operated intermittently. The total operating cost with the two-speed fan including fuel oil and power was approximately the same with both methods but the temperature conditions in the room were improved with the two-speed fan.

The authors found that a reduction in the temperature differential between the breathing level and the floor may be effected by the use of a storm sash, by the use of large volumes of circulating air at lower temperatures, and by the use of registers which deflect the air towards the floor. The results obtained from the use of deflecting types of register located in the baseboard were better than those obtained with the perforated grill type of register in the same location.

A. B. Newton, F. C. Houghten, Carl Gutberlet, and R. W. Qualley are authors of a paper on "Summer Cooling Requirements of 275 Workers in an Air Conditioned Office." These tests were run in the Minneapolis-Honeywell offices, having both men and women employes ranging in age from 20 to 70 years, and other characteristics commonly met with. The offices, which are completely air conditioned, are served by three separate systems.

Previous studies by the Research Laboratory in Pittsburgh and cooperating institutions in Toronto and College Station, Texas, indicated desired effective temperatures of 68 to 71F in Toronto, 69 to 74F in Pittsburgh, and 71 to 74F in Texas. However, these studies gave no measurable indication of any variation in the daily requirements depending upon outside conditions. It was thought that the Minneapolis study would clear up this question. The tests, though, do not demonstrate a definite effective temperature as applying without question throughout the cooling season but do indicate a need for changing the indoor condition when the outdoor conditions are changing violently.

At the last session, the ASHVE inducted its new officers as follows: president, E. H. Gurney; first vice-president, J. F. McIntire; second vice-president, Prof. F. E. Giesecke. A. J. Offner was reelected treasurer, and A. V. Hutchinson continues as secretary.

The new officers of the ASRE are: president, Crosby Field; vice-presidents, Gardner Poole and Charles Thomas Baker; treasurer, George Hulse. David L. Fiske was reappointed secretary.

New officers of the NWAH & ACA are: president, L. R. Taylor, International Heater Co., Utica, N. Y.; first vice-president, C. A. Olsen, Fox Furnace Co.; second vice-president, F. G. Sedgwick, Waterman-Waterbury Co.; secretary and managing director, Allen W. Williams. New members of the board of directors elected were R. M. Judd, H. S. Sharp, H. P. Mueller, and Shirley Percival.

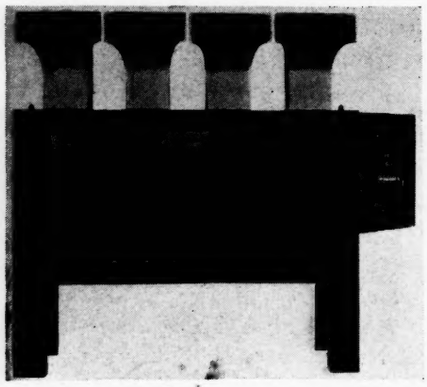
NEW EQUIPMENT

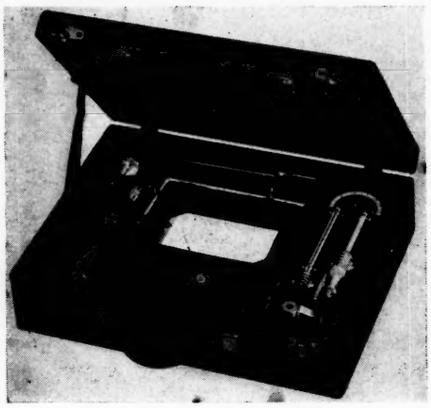
In writing to HEATING & VENTILATING for additional information mention the H. & V. Item Number

Most of the equipment described and illustrated on this and the following four pages was shown for the first time at the recent Fifth International Heating and Ventilating Exposition in New York.

American Blower Unit Heater

NAME—Sirocco unit heater.
PURPOSE—For space heating in industrial and other large buildings.
FEATURES—These unit heaters are available as V-belt driven or direct driven in four types: an inverted wall type, an upright wall type, a floor type, and ceiling type. Illustration shows the floor model. The outlet cowls are proportioned to give an isoformed air flow, high discharge velocity, and minimum resistance. A square base permits changing the direction of air discharge. All fan housings are die-formed with streamline inlets for high efficiency and noise reduction. The lower front and back panels of the heater are removable for inspection and cleaning of the unit. The convectors used with these units are suitable for operation on steam pressures from 2 lb. to 200 lb. and are constructed with copper tubes and fins and cast brass headers. Convectors are of the return bend type with steam and drip headers on the same end. The main casings of this unit are die-formed and are finished in three colors. Units can be equipped with a Thermadjust feature which includes base and bypass damper to provide a means for bypassing a percentage of the air handled by the fans around the convector. This assembly gives a means of obtaining closer temperature regulation with a constant air supply from the unit. The installation of this device can be made either at the factory or on the job after the unit has been installed.
LITERATURE AVAILABLE—Bulletin A-7018.
MADE BY—*American Blower Corp., 6000 Russell St., Detroit, Mich.*
H. & V. ITEM NO. 28A





Illinois Test Kit

NAME—Illinois air conditioning instrument kit.
PURPOSE — For measuring air velocities, air volumes, wet and dry bulb temperatures, and flue gas temperatures.
FEATURES — This kit consists of a velometer for measuring air velocities from 0 to 2500 f.p.m., an averaging jet to measure average air velocities in ducts, a sling psychrometer, a water bottle, a high reading thermometer for flue gas temperature measurements, and an air thermometer for measuring grille and register temperatures. Instructions, tables, and the rubber tubing for use with the instruments are stowed behind a hinged cover.
MADE BY — *Illinois Testing Laboratories, 420 N. LaSalle St., Chicago.*
H. & V. ITEM NO. 28B

Barber-Colman Relay

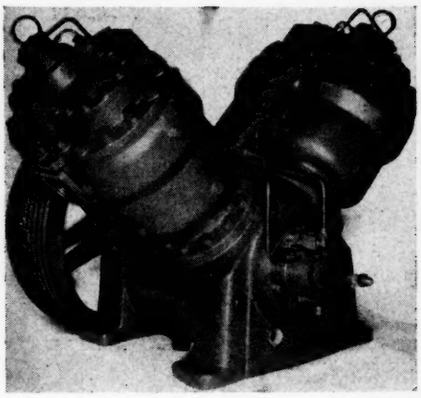
NAME—Microrelay.
PURPOSE—A relay which when connected between a Microtrol or Microvalve, and a rheostat, will give full proportioning of the controlled unit by the operation of the manual rheostat.
FEATURES—The Microrelay is a unit constructed similar to the Microtherm except that the bimetal element is replaced by a spring under tension. This relay can also be used for many other applications to give full proportioning of control units.
MADE BY—*Barber-Colman Co., Rockford, Ill.*
H. & V. ITEM NO. 28C

Fairbanks Gate Valve

NAME—Fairbanks U-bolt gate valve.
PURPOSE—For steam lines up to 150 lb. per sq. in. or gas and liquid lines up to 225 lb. per sq. in.
FEATURES—This valve is designed to meet the demand for a rugged valve at a low cost. It is said that it can be taken apart, inspected and cleaned with a minimum of effort and time. U-bolt locks the body and bonnet firmly together, making a pressuretight joint and adding strength. By removing only two nuts the valve can be disassembled. A double-taper wedge-shaped gate with a knife edge at the bottom is designed to cut through heavy fluids or sediment. Foreign matter is thus forced from the bottom of the wedge chamber where it can flow through the line. When the wedge is fully open it is above the flow. Valve is designed so that it can be repacked under pressure when fully open without leakage.
SIZES—From ½ to 4 in.
MADE BY — *The Fairbanks Co., 393 Lafayette St., New York.*
H. & V. ITEM NO. 28D

Curtis Compressor

NAME—Curtis compressor.
PURPOSE — Compressor for methyl chloride or Freon air conditioning or commercial refrigeration installations.
FEATURES—Built-in automatic unloader and patented pressure lubrication.
SIZES—40 and 50 hp.
MADE BY—*Curtis Refrigerating Machine Co., St. Louis, Mo.*
H. & V. ITEM NO. 28E

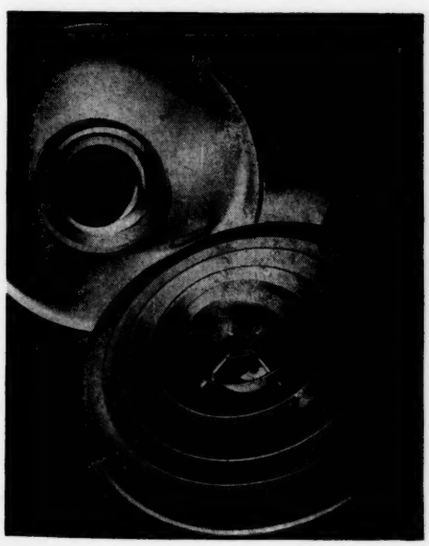


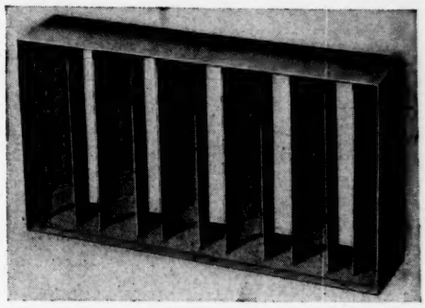
Crane Convector Grille

NAME—Convector enclosure with Plaskon grille.
PURPOSE — Improved appearance, greater adaptability.
FEATURES — Rounded corners, modern styling, sectional, streamlined grille.
SIZES AND CAPACITIES—Wide variety to meet all conditions.
MADE BY—*Crane Co., 836 S. Michigan Ave., Chicago, Ill.*
H. & V. ITEM NO. 28F

Supply and Exhaust Anemostat

NAME AND MODEL NUMBER—Anemostat Type A.
PURPOSE—To fulfill the following functions: air supply, air mixing, and air exhaust.
FEATURES—This Anemostat consists of two sets of hollow flared members spaced within each other. The passages within the three outer members diffuse the conditioned air and draw room air into the device thus mixing room air with the conditioned air. Thus the passages between the three inner members have a suction effect only and extract air from the room. The aspiration effect through the three outer members is equivalent to 30% of the primary air supply while the extraction of the inner members may be as high as 70% of the primary air supply. It is possible to use this Anemostat in combination with a dropped light fixture. When this is done the air passing from the room through the three center passages removes most of the heat from the light bulb before it has a chance to warm the air in the room.
SIZES AND CAPACITIES—Available in eight sizes with capacities ranging from 52 to 3805 c.f.m. air supply and 27 to 1650 c.f.m. air exhaust with velocities ranging from 400 to 2500 f.p.m.
MADE BY—*Anemostat Corporation of America, 10 E. 39th St., New York.*
H. & V. ITEM NO. 28G



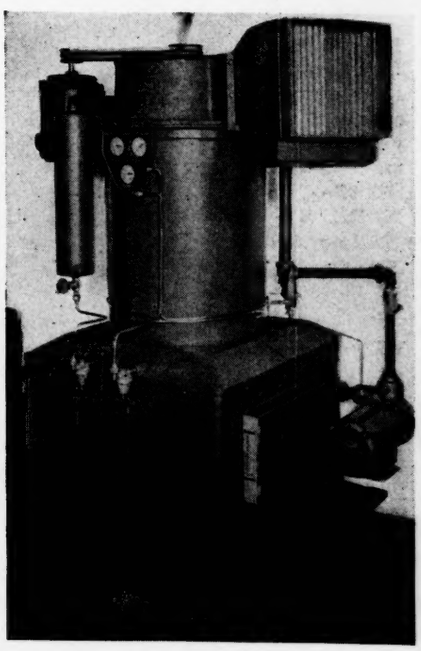


Barber-Colman Damper Controller

NAME—Voladjustor.
PURPOSE—For the control of the volume of air delivered by grilles.
FEATURES—This development incorporates advantages and adjustment features of the Volocitrol which has been offered by this company for use in adjusting volumes in air conditioning systems. In addition, voladjustor dampers include a mechanical linkage between the various blades and a connection by flexible shaft to a remotely operated knob or lever. These units are usually inserted in a discharge duct directly behind the grille and by movement of the wall-mounted knob, volumes of incoming air can be adjusted to any amount throughout the range, or the air supply can be entirely shut off. This new device is said to be particularly adaptable to any individual control of cooling supply.
MADE BY—*Barber-Colman Co., Rockford, Ill.*
H. & V. ITEM NO. 28H

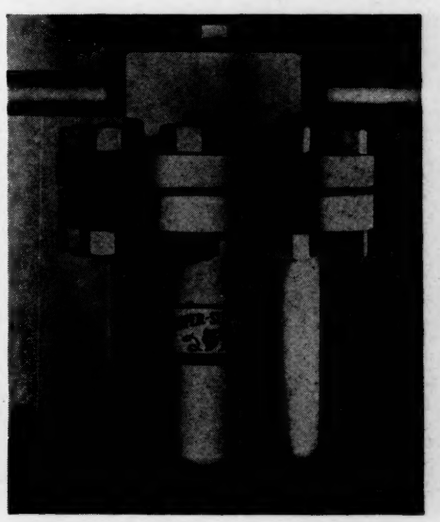
Curtis Evaporative Condenser-Receiver

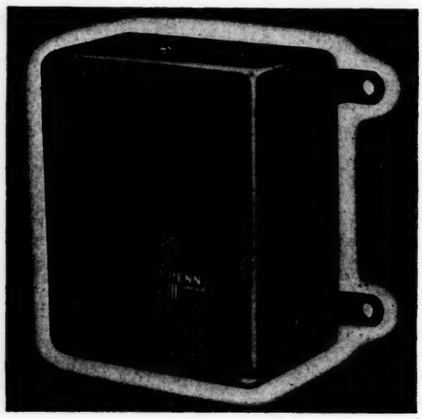
NAME — Evaporative condenser-receiver.
PURPOSE—To reduce cooling water consumption on air conditioning and commercial refrigeration installations.
FEATURES—Principal feature of this unit is the fact that it is cleanable in the same manner that a shell and tube condenser is cleanable. It is said to require only a small fan and pump motor due to the fact that it does not have spray nozzles and the total lift of the water is small. Unit is said to be very rugged because of its construction of cast iron and steel. No fin coil or fin tubing is used. The manufacturer states that a saving up to 95% of water consumption is obtained on some installations.
SIZES—From 3 to 20 hp.
MADE BY—*Curtis Refrigerating Machine Co., St., Louis, Mo.*
H. & V. ITEM NO. 28I



Anderson Steam Trap

NAME—Super-Silvertop forged steel series steam traps.
PURPOSE—A high-pressure steam trap which incorporates the Super-Silvertop features of economy, simple piping, accessibility, and capacity.
FEATURES—These traps are installed straight-in-line using the side inlet connection, or as an elbow using the inlet at the top of the trap. In either installation there are only two threaded joints required. These traps are said to average 122% more capacity than the old style Anderson forged steel traps. Traps are designed for pressures from 150 to 700 lb. per sq. in. The case and head are made of forged steel and gasket joints are of the recess type to prevent any possibility of gasket blow-outs. Valve and seat are made of Anderloy, a special chrome alloy, to reduce corrosion. All other parts are made of stainless steel. All traps are tested under a 1400 lb. pressure.
CAPACITIES—Capacities range from 2800 to 11,000 lb. of condensate per hour.
MADE BY—*The V. D. Anderson Co., 1935 W. 96th St., Cleveland.*
H. & V. ITEM NO. 28J



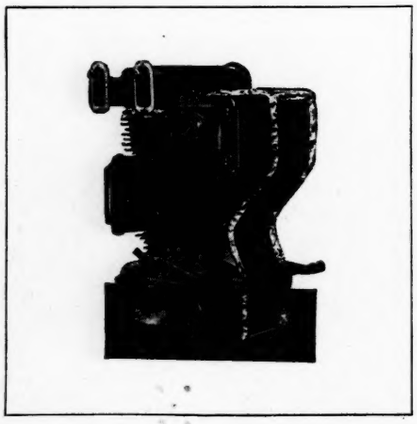


Penn Stoker Timer Relay

NAME AND MODEL NUMBER—Penn stoker timer relay, Type 560.
PURPOSE—For the control of the operation of stokers for motors up to and including 1 hp.
FEATURES—This unit is smaller and more compact than former Penn stoker timer relays. The panel carrying the synchronous self-starting timer, the timer operated cam, the relay and terminals, as well as the new special type air cooled transformer, are all housed inside the case. This control incorporates a low voltage (24 volts) pilot or thermostat circuit using the standard Penn Temtrol of A4 designation. Timer is available for 30 min. or 1 hr. firing intervals when supplied with a 1-hr. timer motor and for 2 hr. and 4 hr. firing intervals when supplied with a 4-hr. motor. The cam units are supplied for one firing frequency per shaft rotation or for two frequencies. Adjustment for length of hold-fire operation may be made from the front of the panel without tools.
MADE BY—*Penn Electric Switch Co., Goshen, Ind.*
H. & V. ITEM NO. 28K

Spencer Automatic Warm Air Furnace

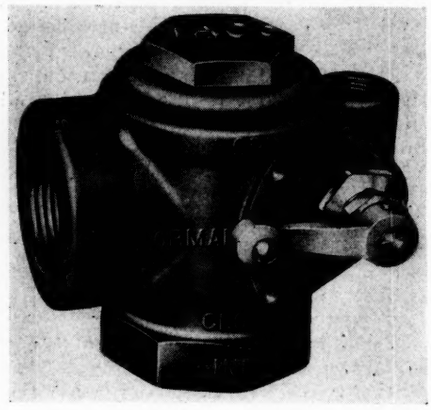
NAME — Spencer automatic warm air furnace.
PURPOSE — For supplying warm air using coal as a fuel.



FEATURES—Coal is placed in a hopper or magazine from which the fuel feeds by gravity to the fire bed. The manufacturer states that there are no moving parts to get out of order and the unit is designed to burn No. 1 buckwheat anthracite. Furnace is made of cast iron with no caulking beween the sections. It is said that this furnace can be easily converted to oil or gas. Standard equipment includes an automatic overload cut-off regulator, check, turn and ashpit damper. Also shaker lever, poker and hoe. An automatic pan type humidifier with outside copper float chamber is available at extra charge.
SIZES AND CAPACITIES—Seven sizes with capacities ranging from 66,000 to 198,000 B.t.u. at furnace.
MADE BY—*Spencer Heater Division, Lycoming Mfg. Co., Williamsport, Pa.*
H. & V. ITEM NO. 28L

Taco Flow Check Valves

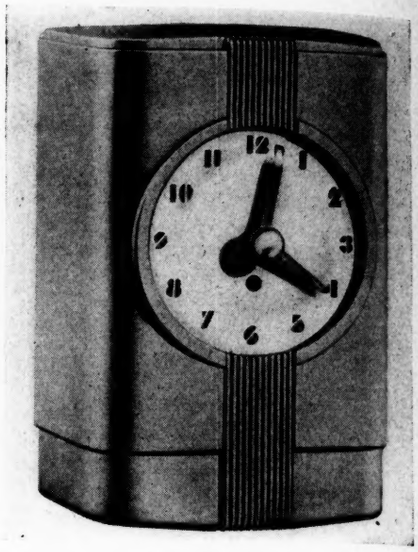
NAME—Taco flow check.
PURPOSE—A check valve for use with Taco hot water heating system to pre-



vent the circulation of water when the circulator is not operating.
FEATURES—This flow check is of the angle type with all brass moving parts. Easy manual operation is said to be a special feature. This valve also provides an opening for the expansion tank take-off.
SIZES—Two sizes, 1¼ and 1½ in.
MADE BY—*Taco Heaters, Inc., 342 Madison Ave., New York.*
H. & V. ITEM NO. 28M

Perfex Thermostat Clock

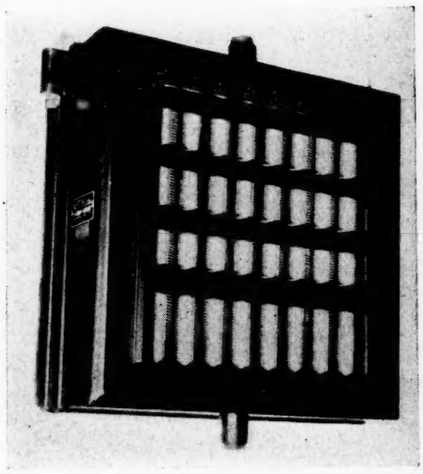
NAME—Timer clock.
PURPOSE—A separate timer clock for use with the Perfex thermostat to give different day and night temperatures.
FEATURES—This clock can be obtained either combined with the thermostat in one unit or as a separate unit. The advantage of having the clock separate is that it may be installed in any part of the home where it will serve best as a time piece. The clock has a low voltage telechron

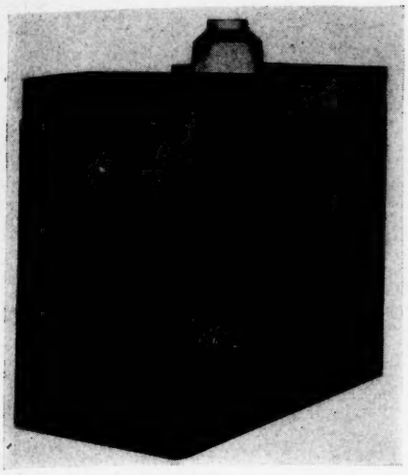


movement. A transformer is supplied at no extra charge to allow it to be operated on a line voltage if desired. The day and night timing periods of operation are set by means of two dials, one on each side of the clock inside the case. The settings are made by turning the two dials to their respective points.
MADE BY—*Perfex Controls Co., 415 W. Oklahoma Place, Milwaukee, Wis.*
H. & V. ITEM NO. 28N

Airtherm Unit Heater

NAME—Airvector.
PURPOSE—For space heating.
FEATURES—The case of this unit incorporates reinforcing beads running completely around the unit to give it strength and to prevent any vibration. The unique cradle suspension of the motor is said to prevent pendulum action on starting and stopping the motor and also deadens any motor hum.
SIZES AND CAPACITIES — Twenty sizes ranging from 74 to 1240 sq. ft. of equivalent direct radiator surface.
MADE BY—*Airtherm Manufacturing Co., 1474 S. Vandeventer, St. Louis, Mo.*
H. & V. ITEM NO. 28O



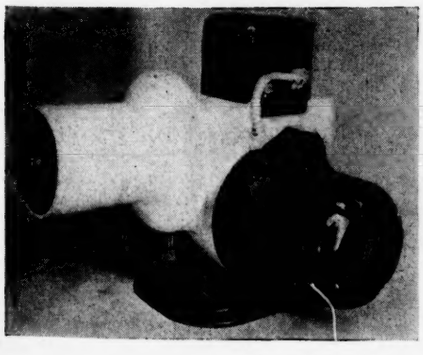


Bryant Forced Air Heater

NAME AND MODEL NUMBER—Bryant forced air heater BA-88.
PURPOSE—A low cost forced air heater for small homes, offices, and stores using gas as a fuel.
FEATURES—Heating sections are provided with cast-iron combustion chamber and flue gas collectors. Heat transfer tubes on small model are chromium steel alloy and on the larger size are finned cast iron. Tubes are streamlined to afford a maximum scrubbing action and staggered to insure a close rubbing contact. A centrifugal blower fan is used to move the air to the unit and ducts. Heater can be used as a complete winter air conditioner by adding low cost filters and an automatic humidifier. Floor space required is 29½ x 56 in.
SIZES AND CAPACITIES—Three sizes ranging from 85,000 to 125,000 B.t.u. per hr. input.
MADE BY—*The Bryant Heater Co., 178-15 St. Clair Ave., Cleveland.*
H. & V. ITEM NO. 28P

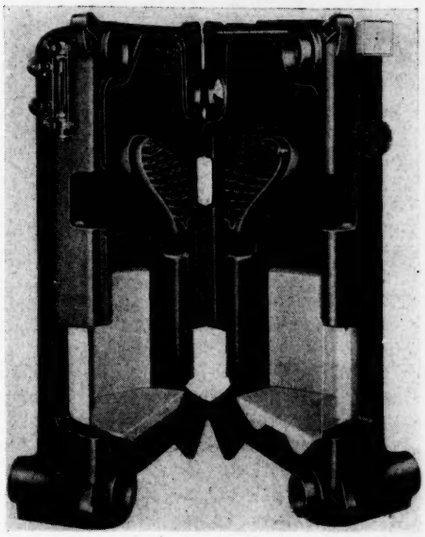
Bethlehem Oil Burner

NAME—Bethlehem-Crusader.
PURPOSE—A low-priced oil burner.
FEATURES—This model offers such features as a Minneapolis-Honeywell intermittent control, a long hour duty Ohio motor, Dongan transformer, Bethlehem Rotaire diffuser, and Econoflame. It is flanged for mounting in oil burning boilers and is supplied with a foot for conversion installations. The manufacturer states that the price of the burner puts it in the lowest priced bracket.
MADE BY—*Bethlehem Foundry and Machine Co., Bethlehem, Pa.*
H. & V. ITEM NO. 28Q

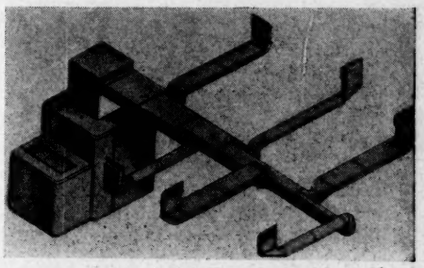


Smith Oil-Burning Boiler

NAME—Five Star oil-burning boiler.
PURPOSE—For supplying steam or hot water utilizing oil as a fuel.
FEATURES—The boiler consists of two large castings and a few miscellaneous parts. A special ceramic firepot locks in without cement. The flue gases pass up and over the overhanging crown sheet which absorbs heat both directly from the burning fuel and from the hot fuel gases. After passing over this crown sheet the hot flue gases travel through a down travel flue and out through an opening in the lower rear of the boiler. Some of the



gases are carried down from the combustion chamber, down the sides and underneath so as to quickly heat the firepot and increase efficiency. A small swing door between the firepot and the down-travel flue operates when the burner comes on in order to provide smooth and quiet operation and to even out firepot draft. A large relief door in back of the boiler offers protection against temporary burner failure. This door opens quickly when necessary and closes automatically. Provision is made for either a built-in low-water cut-off or for a water feeder. Two methods of supplying domestic hot water are available, either a tankless heater consisting of two large copper tubes or a tank heater consisting of a small copper tube.
SIZES AND CAPACITIES—Available in four sizes with steam ratings of 410 to 530 sq. ft.
MADE BY—*The H. B. Smith Co., Westfield, Mass.*
H. & V. ITEM NO. 28R

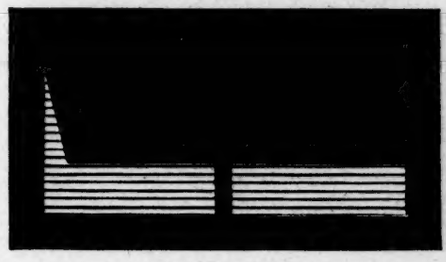


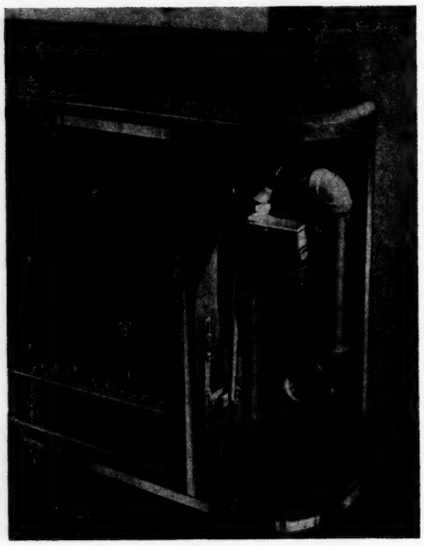
Lamneck Prefabricated Ducts

NAME AND MODEL NUMBER—Lamneck Deluxe, standard and special systems, Series 600.
PURPOSE—Three complete systems of prefabricated ducts for air conditioning or warm air conditioning.
FEATURES—The Deluxe system is made up entirely of rectangular pipe and fittings. This system is designed for installations demanding the utmost in appearance and control of air distribution. The standard system includes the combination of both rectangular and round pipe and fittings and is usually more economical to install than the Deluxe system. This system also permits the use of round pipe where joist construction prevents the use of maximum size rectangular take-offs. The special system uses round pipe and round take-offs entirely, with the exception of the trunk line and wall stacks. The manufacturer states that the special system offers the utmost economy. Trunk line reducers can be used if desired on any or all of the three systems. Any of the systems may be used in or below the joists with the approach to the register open from any angle. Illustration shows the standard system.
MADE BY—*Lamneck Products, Inc., 416 Dublin Ave., Columbus, Ohio.*
H. & V. ITEM NO. 28S

United States Register

NAME—Louver-stamped air conditioning register.
PURPOSE—A close space register for use with air conditioning.
FEATURES—The manufacturer states that this is a close space register of the highest quality and it sells in the low price range.
MADE BY—*United States Register Co., Battle Creek, Mich.*
H. & V. ITEM NO. 28T



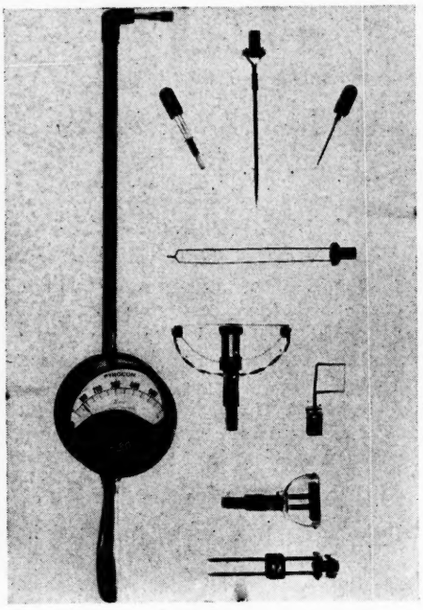


Barber-Colman Unit Ventilator Controller

NAME—Microventrol.
PURPOSE—A combination valve and damper controller for use with unit ventilators.
FEATURES—This unit gives full proportioning to any of the conventional or special cycles adopted by unit ventilator manufacturers. The operator of this unit is mounted on the valve and controls the steam supply directly through a cam and plunger mechanism. The extended power shaft of the motor is connected through a linkage to the damper of the unit and is adjustable to accomplish variable minimum air requirements on the damper as well as all the operating cycles specified. The Microventrol incorporates the Barber-Colman shaded pole, reversing motor, and operates with the potential dividing rheostat to balance the solenoid in any Micro controlling instruments.
MADE BY—*Barber-Colman Co., Rockford, Ill.*
H. & V. ITEM NO. 28U

Yorkaire Conditioner

NAME AND MODEL NUMBER—Yorkaire conditioner, Nos. 275, 350, and 475.
PURPOSE — Self-contained year-round air conditioner for commercial installations.
FEATURES — The compressor, motor, and condenser are assembled on a rigid plate which is in turn provided with cushioned mountings. The fan and motor have similar mounting. These units will be shipped and handled in sections. The bottom section contains the complete refrigeration system and cooling coil, so that the system is shipped completely charged with refrigerant. The units can be quickly installed.
MADE BY—*York Ice Machinery Corp., York, Pa.*
H. & V. ITEM NO. 28V

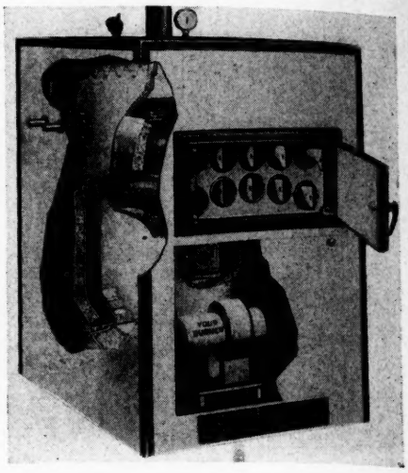


Illinois Pyrometer

NAME—Alnor Pyrocon pyrometer.
PURPOSE — For measuring surface temperatures.
FEATURES — The Pyrocon is a self-contained, portable instrument weighing approximately 3 lb. The metal projecting arm from the indicator is provided with a yoke to receive any of the various types of thermocouples. The 10-in. supporting arm can be rotated and clamped in any position. Likewise, the thermocouples can be turned or placed in various angular positions. With these adjustments the thermocouples can be placed in almost any desired position to permit easy contact with the heated surface. Thermocouples are available for measuring metallic and non-metallic surfaces, revolving surfaces, plastic, rubber, waxes, molten soft metal, and surface temperatures of bearings and other similar metallic surfaces. Temperatures between 0 and 2000F can be measured.
MADE BY — *Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago.*
H. & V. ITEM NO. 28W

Kewanee Steel Heating Boiler

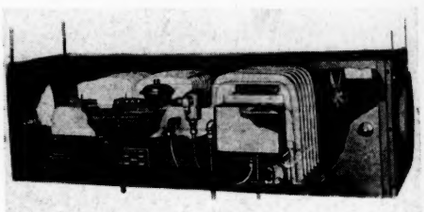
NAME AND MODEL NUMBER—Steel heating boiler No. 1737.
PURPOSE—For heating medium sized homes and small buildings and for furnishing domestic hot water. For use with either oil or gas.
FEATURES — Unit consists of the Round R boiler enclosed in a Smartline jacket. This unit has two-pass tubes. A 75-gal. Kewanee copper coil is standard equipment. Also available with a larger tank coil of 200 gal. capacity or an instantaneous coil of 250 gal. capacity at an additional charge. A Rex Smartline jacket is used for short gun burner enclosures and a Regal jacket for complete gun burner enclosures.



CAPACITIES—900 sq. ft. heating surface net load.
LITERATURE AVAILABLE — Circular RM-92-1.
MADE BY — *Kewanee Boiler Corp., Kewanee, Ill.*
H. & V. ITEM NO. 28X

Bryant Gas Humidifier

NAME—Bryant gas humidifier.
PURPOSE — Gas-fired humidifier for residential installations.
FEATURES — Air entering the unit passes between raised portions of cast iron heating section, inside of which hot flue gases are circulated. This preheated air then passes through a battery of porous refractory plates, the lower ends of which are immersed in a porcelain finished water pan. The warmed humidified air is then carried through a duct to the house. The flue gases after leaving the heating section pass around and below the water pan to the outlet located at the left rear corner of the humidifier. The water is maintained at proper level by an automatic float tank. During off periods of the humidifier a bypass in the thermostatic gas valve reduces the burner consumption to 3000 B.t.u. per hr., which is said to be sufficient to maintain the proper water temperature and retain heat in the air section. Equipment is enclosed in a metal jacket which has a convenient access panel on the side.
SIZES AND CAPACITIES—Evaporating capacity of 15 gal. per day with a gas input of 20,000 B.t.u. per hr. and air capacity of 200 c.f.m.
MADE BY—*The Bryant Heater Co., 178-15 St. Clair Ave., Cleveland.*



H. & V. ITEM NO. 28Y

Average Temperature During a Normal Heating Season

Earlier maps and tables in this series have established the beginning and ending dates of a heating season in a normal year. Once this information is known for a given locality it is a simple matter to determine the average temperature between those dates. Following the conception of the degree-day, the number of degree-days in a normal heating season is the product of both time (days) and temperature. When we divide the number of degree-days in a normal season by the number of days between the beginning and end of the season, the quotient is a measure of the average temperature during the period.

Limits of Season Not Arbitrarily Set

Tables are frequently published giving the average temperature during the so-called heating season, the season being arbitrarily set as the period from October 1 to May 1. It has been shown that the heating season does not necessarily begin in all localities on October 1 nor does it necessarily end on May 1. The average temperature from October 1 to May 1 should be used as the average temperature for the heating season only for those places where the heating season actually begins and ends on October 1 and May 1.

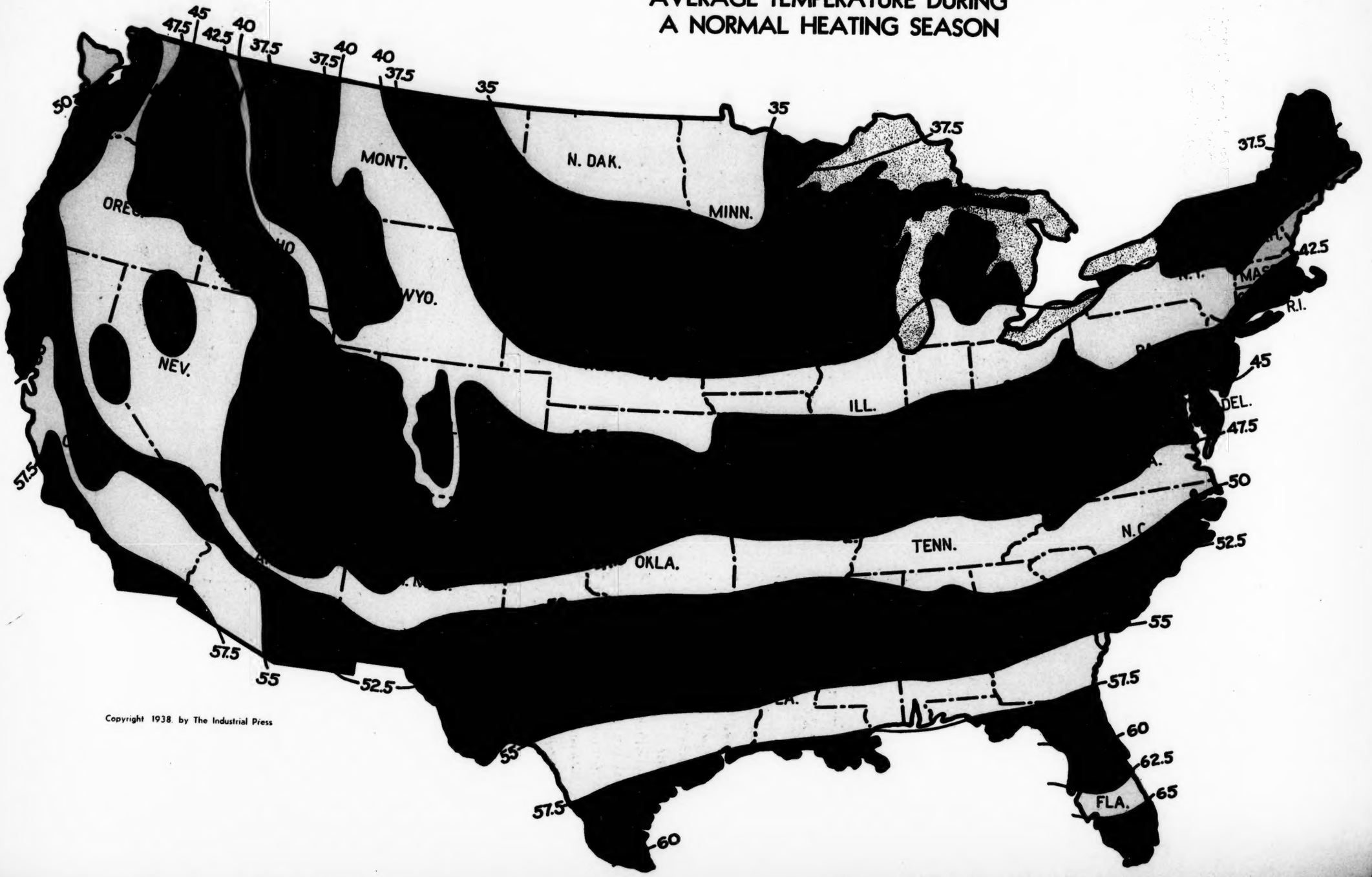
The following table shows the error into which the engineer may fall if he uses as the average temperature for the heating season the average temperature from October 1 to May 1:

City	Average Temperature Oct. 1 to May 1, F.	Average Temperature During Normal Heating Season, F.
Boston	38.1	42.9
Pittsburgh	41.0	43.6
St. Louis	43.6	44.3
Duluth	24.3	39.0
El Paso	53.5	52.3
New Orleans	61.6	57.9
Atlanta	51.5	50.6
Seattle	44.8	51.4

Usefulness of These Data

The average temperature during the heating season is a useful figure in that it makes possible the determination of the total heat loss from a building for the whole heating season. Knowing the number of days the heating season lasts, the temperature to be maintained inside the building, the average outside temperature during the heating season, and the hourly heat loss from the building per degree tem-

AVERAGE TEMPERATURE DURING A NORMAL HEATING SEASON



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AVERAGE TEMPERATURE DURING HEATING SEASON IN A NORMAL YEAR

City	Average Temperature F
Albany, New York	40.4
Albuquerque, New Mexico	47.0
Atlanta, Georgia	50.6
Baltimore, Maryland	45.5
Birmingham, Alabama	55.2
Boise, Idaho	45.2
Boston, Massachusetts	42.9
Buffalo, New York	40.9
Burlington, Vermont	38.6
Butte, Montana	42.3
Charleston, South Carolina	54.9
Charlotte, North Carolina	49.8
Cheyenne, Wyoming	41.3
Chicago, Illinois	40.5
Cincinnati, Ohio	45.4
Cleveland, Ohio	42.0
Columbia, South Carolina	52.5
Columbus, Ohio	43.0
Concord, New Hampshire	40.7
Dallas, Texas	52.5
Denver, Colorado	43.6
Des Moines, Iowa	39.6
Detroit, Michigan	40.8
Duluth, Minnesota	39.0
El Paso, Texas	52.3
Erie, Pennsylvania	41.9
Eugene, Oregon	50.2
Evansville, Indiana	45.7
Fitchburg, Massachusetts	41.7
Flagstaff, Arizona	44.1
Fort Smith, Arkansas	48.8
Fort Wayne, Indiana	41.9
Frederick, Maryland	44.7
Grand Forks, North Dakota	33.8
Grand Rapids, Michigan	40.7
Great Falls, Montana	41.8
Greensboro, North Carolina	48.7
Hartford, Connecticut	42.8
Houston, Texas	56.9
Huntington, West Virginia	44.9
Indianapolis, Indiana	43.1
Jacksonville, Florida	58.8
Kansas City, Missouri	44.0
Knoxville, Tennessee	48.0
Lexington, Kentucky	45.1
Lincoln, Nebraska	40.7
Little Rock, Arkansas	50.6
Los Angeles, California	58.5
Louisville, Kentucky	46.0
Madison, Wisconsin	37.8
Memphis, Tennessee	49.9
Meridian, Mississippi	53.5
Milwaukee, Wisconsin	39.5
Minneapolis, Minnesota	36.4
Minot, North Dakota	34.5
Mobile, Alabama	56.4
Newark, New Jersey	43.4
New Orleans, Louisiana	57.9
New York, New York	43.6
Norfolk, Virginia	49.4
Oklahoma City, Oklahoma	47.8
Omaha, Nebraska	39.9
Paterson, New Jersey	43.7
Pensacola, Florida	57.2
Peoria, Illinois	41.1
Philadelphia, Pennsylvania	44.6
Phoenix, Arizona	56.1
Pittsburgh, Pennsylvania	43.6
Portland, Maine	41.9
Portland, Oregon	50.3
Providence, Rhode Island	43.5
Pueblo, Colorado	44.0
Reading, Pennsylvania	43.5
Reno, Nevada	45.4
Richmond, Virginia	48.1
Rochester, New York	40.7
St. Louis, Missouri	44.3
Salt Lake City, Utah	44.2
San Antonio, Texas	56.7
San Diego, California	58.7
San Francisco, California	56.0
Savannah, Georgia	56.1
Scranton, Pennsylvania	42.0
Seattle, Washington	51.4
Shreveport, Louisiana	53.9
Sioux City, Iowa	38.5
Sioux Falls, South Dakota	37.2
South Bend, Indiana	40.7
Spokane, Washington	43.7
Springfield, Illinois	42.5
Syracuse, New York	39.8
Topeka, Kansas	42.3
Trenton, New Jersey	44.8
Tulsa, Oklahoma	48.2
Vicksburg, Mississippi	54.5
Washington, District of Columbia	45.4
Wheeling, West Virginia	46.1
Wichita, Kansas	44.3
Wilmington, Delaware	45.0
Yuma, Arizona	58.1

perature difference, we need only multiply the temperature difference by the hourly heat loss per degree temperature difference by twenty-four times the number of days in the heating season to obtain the total heat loss for the season. This is one method, and a simple one, of determining beforehand an estimate of fuel to be consumed in the normal heating season.

Average for a Specific Year

The actual average temperature for the heating season for a specific year for one location would be the average temperature of all the average temperatures on days when the daily mean temperature was below 65F. For example, in the heating season of 1936-37 the average temperature of all such days in New York was 44.2F as compared with a normal temperature for the heating season of 43.6F. For the same heating season in New Orleans the average temperature by count was found to be 55.7F as compared with the normal of 57.9F.

Map and Table

The accompanying table gives the average temperature during a normal heating season for 100 of the largest cities, while the map shows this information graphically as well as being a guide for use in localities other than those covered by the table.

The isothermal lines in the map show clearly the effects of the Appalachian Mountains in the East and the Rocky and other mountains in the West. As in previous maps the lines are not particularly accurate in the 11 western states but are believed to be reasonably so in the eastern two-thirds of the country.

INDUSTRIAL EXHAUST VENTILATION

Exhaust Hood Entry Coefficients

By JOHN L. ALDEN

THE progressive changes in static pressure occurring in a suction pipe are plotted in Fig. 39. The mechanism of flow at the mouth of a suction opening is an excellent application of Bernouilli's theorem which states that the sums of the static and velocity pressures at various planes in a given pipe are constant if energy is neither gained nor lost.†

The negative pressure in the plane of the orifice causes air to flow from the atmosphere toward the opening with increasing velocity as the latter is approached. Between the pipe mouth and the vena contracta the stream accelerates and the increase in velocity is accompanied by a drop in static pressure. The latter reaches its minimum in the plane of the vena contracta where the cross sectional area of the stream is the least and the velocity is greatest. Thereafter, the jet expands to fill the pipe, the velocity diminishes, and the static pressure rises to a maximum. Friction loss causes the static pressure to fall progressively from this point to the fan inlet. In a cylindrical pipe the plane of the vena contracta is located about 0.2 diameters downstream from the orifice and the plane of maximum static pressure about 0.8 diameters.‡ The exact locations of these significant planes depend upon the nature and degree of constriction of the opening at the pipe mouth and, probably, upon the velocity.

Effect of Suppressed Contraction

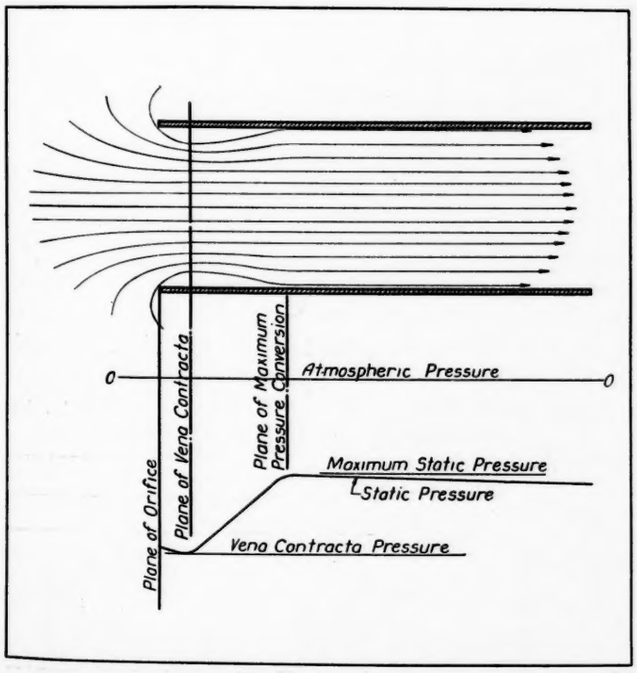
The formation of a vena contracta is always accompanied by a reduction of volumetric flow from that to be expected solely from the static suction and the pipe area. It tends to decrease hood efficiency in the sense that maximum flow from a given pressure constitutes maximum efficiency. While the velocity at the vena contracta closely approaches that to be expected from complete conversion, differing only by the amount of the loss, perhaps 2½%, the vena contracta area is substantially smaller than the pipe area. The combination of the velocity loss and the reduction of effective area reduces the entry coefficient to less than unity. The greater the contraction of the stream, the lower is the coefficient and the smaller the flow. Consequently, any circumstance which suppresses jet contraction is beneficial to hood effectiveness.

In Fig. 37e,* the boundary flow lines curl through an included angle of approximately 180° whereas those in Fig. 37c* bend not more than 90°. The lessened inward angular curvature of the latter results in partial

†"Industrial Exhaust Ventilation, Flow of Fluids," by John L. Alden, HEATING & VENTILATING, September, 1937, pages 41-42.

‡"The Intake Orifice and a Proposed Method for Testing Exhaust Fans," by N. C. Ebaugh and R. Whitfield, ASME Transactions, Vol. 56, No. 12, December, 1934, pages 903-911.

*The Fig. 37 referred to in this article appeared on page 51 of the December, 1937, issue of HEATING & VENTILATING.—Editor



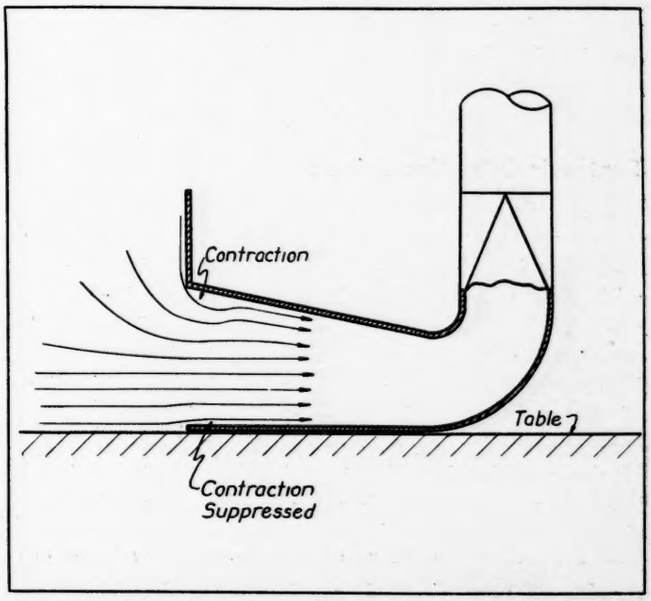


Fig. 39. (Left) Static pressures at entrance to suction pipe. Fig. 40. (Above) Suppression of contraction by adjacent planes.

suppression of the jet contraction. Contraction is also reduced when several thin-plate orifices lie close together as in a perforated sheet metal grille. An increase in flow through orifices so arranged of the order of 5% to 10% has been observed. The presence of planes adjacent to the mouth has a similar effect. Thus, the coefficient of discharge of a metering orifice in the wall of a plenum chamber is raised measurably when the orifice is located within 3 diameters of a side wall. Still more pronounced suppression takes place when closely adjacent planes form a practical continuation of the sides of a suction opening. A common example is that of a hood resting on a machine table as illustrated in Fig. 40. The flow lines indicate that practically no contraction takes place on the side of the mouth nearest the table. The influence of the lessened contraction on the orifice coefficient and, hence, the rate of flow, is proportional to the fraction of the orifice periphery over which suppression takes place. Thus,

$$C_e = c_e \left(1 + 0.12 \frac{L}{p}\right)$$

where

C_e = coefficient of entry of orifice with suppression
c_e = coefficient of entry of same orifice without suppression
L = length of side of orifice over which suppression takes place
p = periphery of orifice.

Thus, the entry coefficient of a square hood in which suppression takes place is increased about 3% for each side affected by suppressing planes arranged as in Fig. 40.

Entry Coefficients of Hoods

In the field or laboratory, entry coefficients are obtained by direct measurement of the branch pipe suction and corresponding volumetric flow rate. The engineer should neglect no opportunity to collect such hood data. A careful compilation of actual hood coefficients together with records of surrounding conditions is an essential to accurate estimating. Nevertheless, there are many occasions on which it is necessary to estimate the coefficients of hoods from contractor's sketches without the aid of actual tests of similar hoods. In such instances fair accuracy may be obtained in synthesizing the coefficients from the data provided in Fig. 37.

Synthetic Entry Coefficients

Hoods whose shapes are reasonably close to the simple geometrical forms of Fig. 37 will have coefficients departing but little from those tabulated. Thus, pyramidal or cone-shaped hoods or those whose air passages are without sudden expansion or contraction may be compared with flanged or unflanged pipes or cones. More complex forms may be treated as combinations of orifices, usually in tandem. Velocity changes are evaluated and pressure losses estimated for each unit of the combination. The total effect of the series of losses is then reflected in the resulting synthetic coefficient.

For example, the grinder hood, Figs. 33 and 41d, consists of two orifices in tandem. The first is the entrance from the atmosphere to the large chamber enclosing the wheel and the second is the junction of the branch pipe and chamber. The former is treated as an unflanged pipe, Fig. 37e, while the latter is similar to the flanged pipe, Fig. 37c, with partially suppressed contraction due to the presence of the hood walls. The suction set up in the large chamber must be deducted from the branch suction to obtain the effective pressure causing flow from the chamber into the pipe. The fol-

Hood Type	Entry Coefficient C_e	Entry Loss Vel. Heads h_t	Nearest Simple Orifice (fig 37)
a. Canopy Hood	0.82	0.49	Flanged Pipe
b. Booth	0.82	0.49	Flanged Pipe
c. Hopper	0.82	0.49	Flanged Pipe
d. Grinder Hood	0.79	0.60	Flanged Pipe – Chamber Loss Reduces C_e -
e. Lathe Top Hood	0.82	0.49	13° Unflanged Cone
f. Smoke Hood	0.57	2.08	Unflanged Pipe and Mitre Elbow–Suction Measured in Pipe
	0.72	0.93	Unflanged Pipe only–Suction Measured in Hood
g. Floor Sweep	0.61	1.69	Unflanged Pipe and Square Throat Elbow–Suction Measured in Pipe
h Floor Sweep	0.57	2.08	Unflanged Pipe and Mitre Elbow – Suction Measured in Pipe
i. Shaper Hood	0.71	0.99	30° Unflanged Cone and 2 Elbows – Suction Measured in Pipe above Square-to-Round

Fig. 41. Entry coefficients of typical hoods.

TABLE 4—COMPARISON BETWEEN SYNTHETIC AND ACTUAL ENTRY COEFFICIENTS

Hood Form, Fig. 41.	Entry Coefficient	
	Synthetic	Actual
a	0.82	0.84
b	0.82	0.815
c	0.82	0.835
e	0.82	0.825
g	0.61	0.64
i	0.71	0.70

lowing steps illustrate the process of synthesizing the entry coefficient.

Given: Branch suction, 2.0 in. wg.,
Maximum chamber entrance velocity, 1300 f.p.m.
Chamber entrance velocity pressure, Fig. 42, = 0.11 in. wg.,
Chamber entrance loss, Fig. 38, = 0.93 h_v = 0.10 in. wg.,
Chamber suction = 0.11 + 0.10 = 0.21 in. wg.,
Effective branch suction = 2.0 — 0.21 = 1.79 in. wg.,
Corresponding velocity, Fig. 42, = 5360 f.p.m.,
C_e, flanged branch, no suppression, Fig. 37, = 0.82
Addition for suppression, estimated, = 0.01
C_e, flanged branch with suppression, = 0.83
Branch velocity = 5360 × 0.83 = 4450 f.p.m.,
Velocity corresponding to branch suction, Fig. 42, = 5670 f.p.m.,

$$C_e, \text{ hood}, = \frac{4450}{5670} = 0.79$$

With experience, the engineer will gain facility in estimating coefficients without the necessity for detailed calculations. He will find that for chamber-type hoods whose face velocities do not greatly exceed 1000 f.p.m., an acceptable procedure is to select a coefficient appropriate for the branch connection and to reduce it by an estimated amount, say, from 3% to 5%, to allow for the mouth loss or chamber suction. Experience indicates that synthetic coefficients are more likely to be high than low because the actual hood is usually less favorable in form than the fundamental shapes in Fig. 37 from which its coefficient has been derived. Every effort should be made toward acquiring skill in estimating coefficients by inspection of freehand sketches of hoods and their surroundings. By so doing, the engineer renders himself independent of rule-of-thumb methods of flow estimating. He is able to treat each hood as an individual flow problem to be solved so accurately and so rapidly as to remove the temptation to use a single blanket coefficient as is recommended by some writers.

Entry Coefficients of Typical Hoods

A number of common hood forms with their coefficients and losses are arranged in Fig. 41. The notes supply the basis on which coefficients may be synthesized. In each instance the simple orifice forms of Fig. 37 furnish the essential data for estimating workable coefficients.** The reliability of synthetic entry coefficients is illustrated by the close agreement between synthetic and actual measured coefficients listed in Table 4.

It will be observed that Fig. 41b is the only hood form identical with an elementary shape shown in Fig. 37. Most of the remainder have been approximated by visual comparison with the parent forms. Thus, the canopy hood, Fig. 41a, lies between the flanged pipe and the 30° unflanged cone. These forms are of the same family in that the flanged pipe may be considered to be a cone of 180° included angle. Both tend to suppress contraction at the entrance although the flanged pipe does so to a greater degree. The area of the conical mouth of the canopy is so great that the velocity at the rim is very low. Hence, the mouth loss due to contraction is infinitesimal and the only loss that need be considered is that at the union of the branch pipe and the canopy.

While the included angle formed by the sides of the small lathe hood, Fig. 41e, is approximately 20° and the coefficient tends to be lowered thereby, the value for the 13° cone is used since the extended chip baffle suppresses contraction by an offsetting amount. Fig. 41f shows a small local hood for exhausting soldering fumes. The area of the mouth is equal to the pipe area. Since the pipe joins the hood at a sharp right angle, the elbow

**The elbow data used for hoods f, g, h, and i will be presented later in this series.

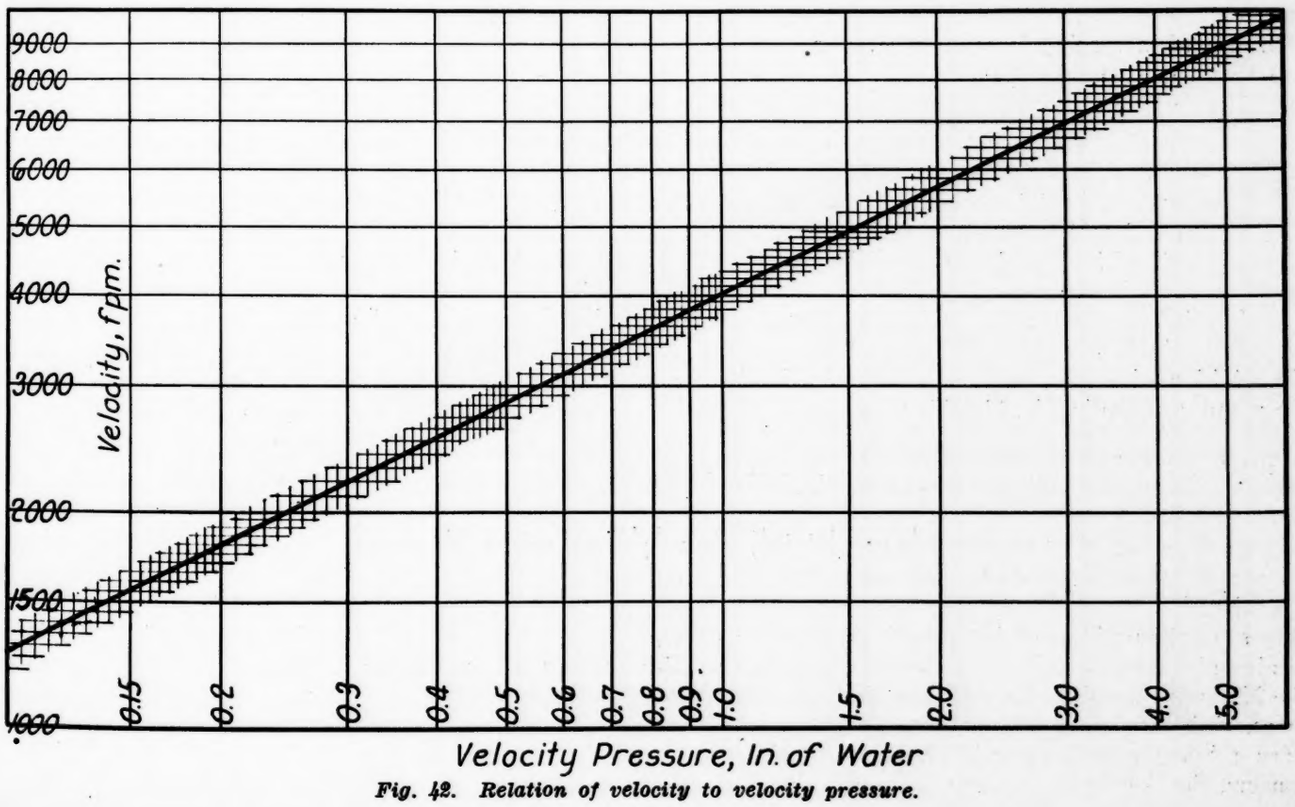


Fig. 42. Relation of velocity to velocity pressure.

loss may be taken as being close to that of a mitre stovepipe elbow. When the suction is taken in the pipe, the elbow loss must be included in the hood loss. If the suction is measured in the hood, the elbow loss becomes part of the piping loss. In the first case the entry coefficient is low while in the second it is higher because of the omission of the elbow loss. Similar considerations apply to the floor sweeps g and h and the shaper hood, i. The hoods illustrated in Fig. 41 have been taken from actual installations and do not necessarily represent optimum designs.

Typical Flow Calculations

An early step in the design of every exhaust system is the computation of flow data for each hood of the system. The problem takes two general forms. The first is one in which the State or some other agency prescribes or recommends the branch pipe diameter and suction. With these as a basis the branch pipe velocity and the volume rate of flow through the hood are figured. In the second form the pipe size and velocity are given and the volume and static pressure are required. Typical calculations for the grinder hood, Fig. 41d, with 4½ in. branch pipe follow:

1. When the static suction is given:

$$Q = 4008\ C_e A \sqrt{h_s}, \text{ in which } A = 0.11 \text{ sq. ft.}$$
$$C_e = 0.79$$
$$h_s = 2.00 \text{ in. wg.}$$
$$Q = 4008 \times 0.79 \times 0.11 \sqrt{2.00} = 493 \text{ c.f.m.}$$
$$V = \frac{493}{0.11} = 4480 \text{ f.p.m.}$$

2. When the branch pipe velocity is given:

$$Q = VA, \text{ in which } V = 4500 \text{ f.p.m.}$$
$$A = 0.11 \text{ sq. ft.}$$
$$Q = 4500 \times 0.11 = 495 \text{ c.f.m.}$$
$$h_s = h_v + h_l, \text{ in which } h_v = 1.26 \text{ in. wg., from Fig. 42,}$$
$$h_l = 0.60\ h_v, \text{ from Fig. 38.}$$
$$h_s = 1.0\ h_v + 0.60\ h_v = 1.60 \times 1.26 = 2.02 \text{ in. wg.}$$

Methods of Increasing Flow Through Hoods

Any method of raising the entry coefficient will increase the flow through a hood without increase of suction. Study of the elementary forms in Fig. 37 will indicate the more favorable shapes to follow. A further improvement is gained by the avoidance of repeated acceleration and deceleration of the air stream. A concrete example of improved flow conditions is the substitution of conical pipe inlets from booths and chambers for the more common straight pipe connections. An increase in flow of nearly 15% is possible. Similarly, the addition of flanges to the smokehood, Fig. 41f, in the manner shown in Fig. 43, adds little to the cost and

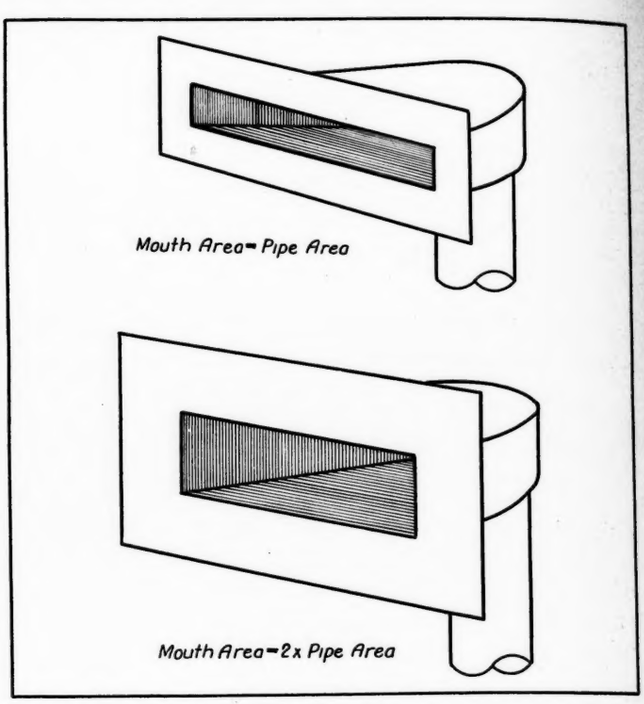


Fig. 43. Addition of face flanges to increase flow through smokehood.

increases the flow about 14%. In addition, its velocity contours are shifted so as to improve the effectiveness of the hood as explained in an earlier article of this series. If the face area of the same hood be increased without change in branch pipe diameter a further increase in flow takes place. In general, doubling the face area will raise the flow rate by 20% to 30%. The designer has the choice of maintaining the original volume at lower fan speed, pressure, and power consumption or increasing the flow at the same pressure with corresponding increase in power.

While much of the material in this section has been prepared for the benefit of the exhaust system designer, it is no less useful for the engineer entrusted with the purchase of a system. He should insist that the contractor submit with his proposal sketches of the principal hoods together with the expected suction and other pertinent flow data. From these the purchaser can make an independent check on the aerodynamic efficiency of the hoods and can estimate their probable effectiveness in controlling dust. The prudence of checks on all design factors cannot be emphasized too strongly. Only in this way can the buyer assure himself of the adequacy of the system, its economy of operation, and the general competence of the designer.

New British Bus Ventilation System

A NOVEL ventilating device which may do much to solve the problem of drafts in the interior of buses has been introduced by T. P. Easton, general manager of the Newcastle-on-Tyne Corporation Transport Department. A hollow metal tube is substituted for the ordinary rail suspending strap-handles for standing passengers. This tube is continued through the front of the vehicle to an air scoop, and is sealed at the rear end. Small holes are drilled at frequent intervals in the tube to allow a passage of air into the bus. Experiments with the device show that it successfully eliminates stuffiness without causing drafts. It has been fitted to 12 Newcastle buses to undergo various conditions of service.

Factory Office Heated by Forced Hot Water

New General Motors Plant at Linden, N. J.

By F. O. JORDAN†

As a unit in the assembly plant at Linden, N. J., the general office building presented problems notably different from those faced when a heating plant for the factory building was considered. Forced hot water heated by steam from the boiler house was finally adopted. Local circumstances permitted a most unusual plan for generating steam with refinery gas while providing for emergency operation with oil fuel. In a recent issue the author described the unit heater installation in the factory building. Here we learn how the office building is heated.

HEATING of the office building presented an entirely different problem from those encountered in providing a suitable system for the 23-acre factory building. This building, shown in the illustration above at the front of the factory and a considerable distance away from the boiler plant, has a basement and first and second story and is of conventional construction throughout. The load computed by the usual methods called for the installation of 5400 sq. ft. of direct radiators.

Forced Circulation Hot Water System Used

The gravity steam heating cycle was decided against, partly because the basement was to be occupied by offices so that it was desirable to locate the radiators under the windows at the floor. Such an arrangement would have involved the added expense of underground tunnels for the returns, or of running the returns in underground conduit.

Because of these limitations, a two-pipe forced circulation hot water heating system using direct radiation was employed. By using this type of heating system, the central equipment was limited to a comparatively small water heater and circulating pump, while it was possible to run both the hot water supply and return overhead, thus eliminating the necessity of underground returns. Furthermore, the past experience of the designing engineers made them favorable to this type of heating system for the following reasons:

A—Low cost, because of the small radiator, and more especially the small supply and return pipe sizes made possible by the use of high temperature forced water at considerable velocity. The absence of condensate traps and other specialties required by certain other methods of heating are factors in its economy also.

B—Exceptionally constant inside conditions maintained by automatic regulation of water temperatures to suit weather conditions.

The hot water supply and return mains are installed in the attic space above the second floor, and are connected by means of supply and return risers respectively with the radiation below, thus obviating the necessity of underground trenches or conduit, or exposed returns under the basement radiators. The system is of the open type, with vented expansion tank.

Radiators are located under the windows. The system is so arranged that the circulating pumps draw the water through the return mains from the radiators after its heat has been given up to heat the building, and circulate it through the exhaust steam water heaters to be heated and forced through the supply piping back to the radiators again.

†Consulting Engineer, Detroit.

Circuits are Balanced for Friction

The design is based upon water entering the radiators at 200F and leaving them at 170F, with a total water friction through the entire system of a water head of 20 ft. The sizes of mains and connections in all cases are so selected that all parallel water circuits throughout the entire system have the same water friction within 1%. The success of this type of system largely depends upon the accuracy with which the friction in all parallel circuits are balanced.

Duplicate water heaters and circulating pumps are provided for the office heating system, each being able to carry the load. Each heater has a capacity of heating 100 g.p.m. of water from 175F to 205F when steam is supplied to the coils at 30 lb. pressure gage. The capacity of each pump is 100 g.p.m. of water against a water head of 20 ft. An exhaust steam main is run overhead through a bridge to the office building from the factory to furnish steam for heating the water.

Condensate Return

Condensate from the steam heating coils in the heaters is returned by means of a condensate return pump to the condensate receiver above the boilers.

The circulating pumps operate under manual control only. The steam supply to the water heaters is regulated automatically so that the temperature of the water supplied to the system is held at the proper level to insure even constant heating in the building at the existing outside weather conditions of temperature and wind velocity.

Upon a gage board located adjacent to the heaters and pumps are mounted recorders for recording outside temperature, and water temperatures supplied to and returned from the hot water heating system. Indicating gages are installed also for indicating steam pressures to the heaters, circulating pump discharge and return pressures, and the level of the water in the hot water heating system.

High Pressure Steam Boilers

The boiler house, which covers an area of 80 ft. by 105 ft., extending 52 ft. above ground and 4 ft. below grade, is located adjacent to the factory building, being connected to it by an overhead bridge which houses the heating mains to and from the factory.

Three water tube boilers of the bent tube type are installed, each having a nominal rating of 750 boiler hp. and designed to deliver 1500 boiler-hp. at continuous operation.

In addition to the regular heating surface, these boilers are equipped with water walls at both bridge and side walls. The boilers are supported in the conventional manner from cross beams resting on H columns, and are enclosed by suspended masonry walls. The combustion space is refractory lined in the usual manner. Each boiler delivers steam at 175 lb. gage pressure through a 10 in. non-return valve and O.S. & Y. gate to the high pressure main which is supported by expansion hangers about eight feet above the boiler room floor.

The portion of the boiler house equipment costs which rightfully should be charged against the heating system is difficult to determine. However, the total developed horsepower of the boiler at the guaranteed 200% of rated boiler horsepower is 4500 boiler hp., of which about 1500 boiler hp. is required to generate steam for the heating system. On this basis, one third of the cost of boilers, auxiliaries, piping, and boiler house should be charged against the heating system.

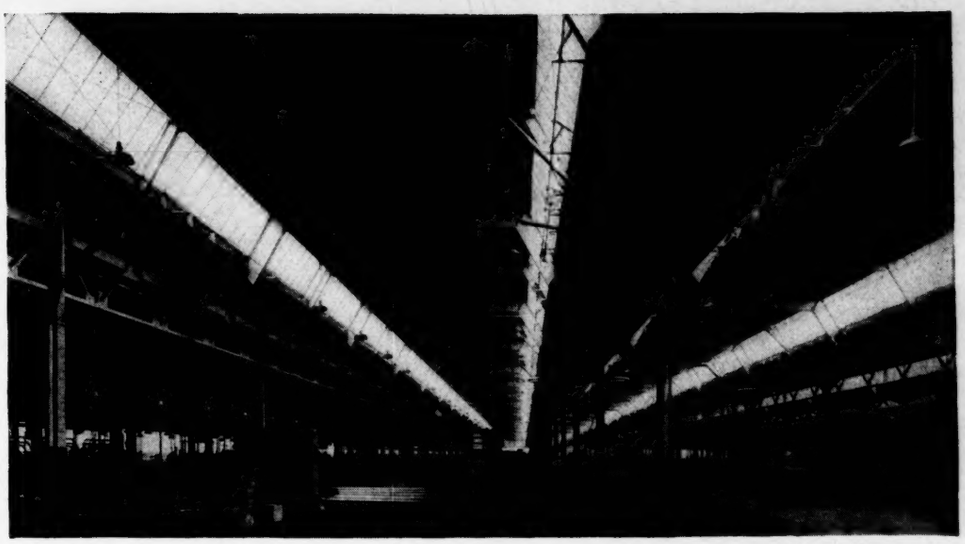
Steam Distribution and Return

From the high pressure steam header in the boiler room, steam is delivered to engine-driven air compressors. Exhaust steam at 30 lb. gage pressure is delivered from the engines through an exhaust steam main to the factory, where it is used in connection with the bonderizing, spraying and drying processes.

Since the quantity of exhaust steam is sufficient only for process purposes, a live steam main transmits steam at 175 lb. gage pressure, over the bridge into the factory, where it is reduced at various points for heating service.

Condensate, which is returned by the condensate return pumps in the factory, is discharged to a vented condensate receiver located in the boiler house roof trusses above the boilers, whence it is returned by gravity under float control to the open feed water heater. The feed water heater is carried on structural steel

Typical outside bay showing vertical inverted unit heaters in monitor top, and heating main with expansion bends.



Typical inside bay showing 25 ft. high monitor supported on I-beams bent to shape of monitor and welded; horizontal unit heaters in monitor top; and heating mains above knee braces, leaving monitor space clear.

supports about 12 ft. above the boiler room floor.

Makeup water is admitted to the condensate receiver under control of a float valve. Exhaust steam for heating boiler feed water is taken from steam turbine driven auxiliaries and from the main exhaust header, which is vented to atmosphere through a back pressure valve set at 38 lb. gage, and through an exhaust head.

Combination Oil and Gas Burners Installed

The purchaser wished to take advantage of the opportunity for a low cost fuel supply offered by the use of byproduct gas from a nearby oil refinery. Yet the refinery was unable to guarantee that the supply of gas could be depended upon at all times, although to throw the entire plant out of operation because of lack of fuel for generating steam for process work as well as heating service would be unthinkable to all parties concerned.

The problem of designing a system which normally would operate on cheap refinery gas, but which could instantly be made to function with a standby fuel was solved by installing combination gas and fuel oil burners in the boiler.

Normally, these burners consume refinery gas which is supplied through an underground main from the refinery which is located several hundred feet away. In case of a failure in gas pressure, the burners instantly begin to function as mechanically atomizing oil burners drawing their supply of fuel oil from an emergency fuel oil system consisting of the following:

(a) a tank which is kept in readiness for instant use, full of fuel oil and connected to the pipe line which supplies the burners; (b) a fin type oil heater for heating the oil to the viscosity required for proper operation of the burners; and (c) oil circulating pumps, for supplying the fuel oil to the burners at the proper rate and pressure.

The layout of the boiler house equipment and heating system was made by the office of Albert Kahn, Inc., architect for the Linden plant.

Moisture Condensation on Unglazed Pictures

NOWADAYS, in almost all picture galleries, the paintings are exhibited in glazed frames. The original purpose of the glazing seems to have been to prevent the soiling of the pictures by contact with the smoky atmospheres of large towns and, despite the efforts that have been made to minimize atmospheric pollution, this is probably still its most useful function. It seems probable also that the glazing serves to minimize the risk of condensation on the picture surfaces.

Esthetically, however, the presence of the glass is unfortunate, for its polished surfaces act as mirrors and in many instances the reflected images interfere seriously with the correct viewing of the pictures. H. L. Beckett of the British Research Station reports in the Journal of the Institution of Heating and Ventilating Engineers the results of one experiment which has recently been made at one picture gallery of removing the glazing from certain pictures.

From an inspection of pictures in the gallery it seemed probable that the trouble arose on those occasions following a change from cold to milder weather, when the air in the gallery was humid and the external walls were comparatively cold.

Two methods of dealing with the problem suggested themselves. One was to hang the picture clear of the wall surface so that there was free access of air to the back of the canvas. The more promising method was to fix a thin metal-faced diaphragm behind the canvas to minimize the heat-flow by radiation.

These methods have been tested experimentally at the Building Research Station and the following conclusions may be drawn from the results:

1. The unbacked canvas of a picture may be cooled several degrees below the temperature of the air in a room by radiation to an external wall.
2. The difference of temperature between the air and the picture surface is not greatly affected by fixing the picture clear of the wall surface.
3. By providing a diaphragm of reinforced aluminum foil at the back of the canvas it is possible to reduce the cooling effect of the wall very considerably. The picture is then maintained substantially at air temperature and the possibility of moisture condensing upon the surface is greatly reduced.

EDITORIALS

Price Increase Facts

Ever since the recession in business began some months ago there have been accusations and statements aimed to prove that the rise in prices of commodities, materials, and manufactured products were the cause of the trouble. Particularly has attention been directed toward the building industry which was one of the heavy industries which started the year with such high hopes only to see activity taper off. There is no doubt but that prices did advance. Also there is no doubt but that the rise in building material prices did affect the situation. However, as usual when general or overall figures are used, the whole story is not revealed. To get at the true facts it is necessary to do a little digging. The index numbers of wholesale prices as published by the Department of Labor are enlightening. They show that last October building material prices in general stood at 95.4% of their 1926 level. They also show that of all the separate groups the plumbing and heating indexes were lowest, standing at 80.6% of their 1926 level. Not only did these prices increase the least of any in the building group during 1937 but they were actually much lower than in 1926. A purchaser of plumbing and heating material last October was getting $1.24 worth of 1926 value for each dollar he spent. Moreover, he was getting an immeasurably better article. Consequently, we can hold our heads high in the face of generalized accusations about price rises. If all the other building material groups had an equally good record, charges of this kind would probably not be passed around so freely.

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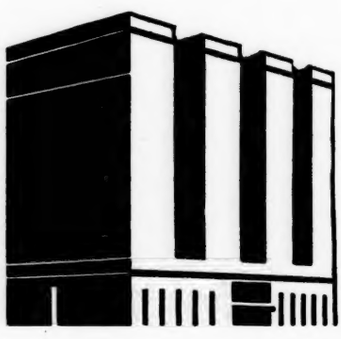
Self-Contained Cooling Units

When the fully self-contained air cooling and dehumidifying unit to simply be wheeled in and plugged into an electric outlet was predicted a number of years back plenty of people were openly skeptical. Here was simply another of those pipe dreams of a lot of theorists. When it was foreshadowed clearly a few years later there were still many who doubted if it would actually get anywhere. Then the early units began to appear and some of them were indeed distinctly laughable. Now for the past five years they have undergone a period of intensive development. Most of this development has been under the covers for the external appearance and dimensions have changed but little. They do perform better now. They are much more quiet, they don't leak, and the air stream to the room can be directed and controlled readily.



Last year these units in various forms began to catch the public eye. They were sold to the extent of several million dollars worth. A number of large sales organizations are all set and primed to push them even harder this year. Given a good break the number of these units which go into use this year may easily double. It is possible that figures like 50,000 for these units may be recorded by the time the annual record is complete. In other words, in spite of all doubts and early skepticism, the self-contained cooling unit is here and is on the way toward general user acceptance.

It is equally important that they gain trade and technical acceptance. There is little doubt but that these units carry the threat of greatly changing certain established trade practices. They do open up possibilities and the wise engineer, contractor, or dealer will immediately take steps to become familiar with them, to learn how they perform, their limitations, types, capacities, and how and where they may be installed with confidence. Many have already gained a good grasp and understanding of this kind of equipment. Those who have not, should not delay.

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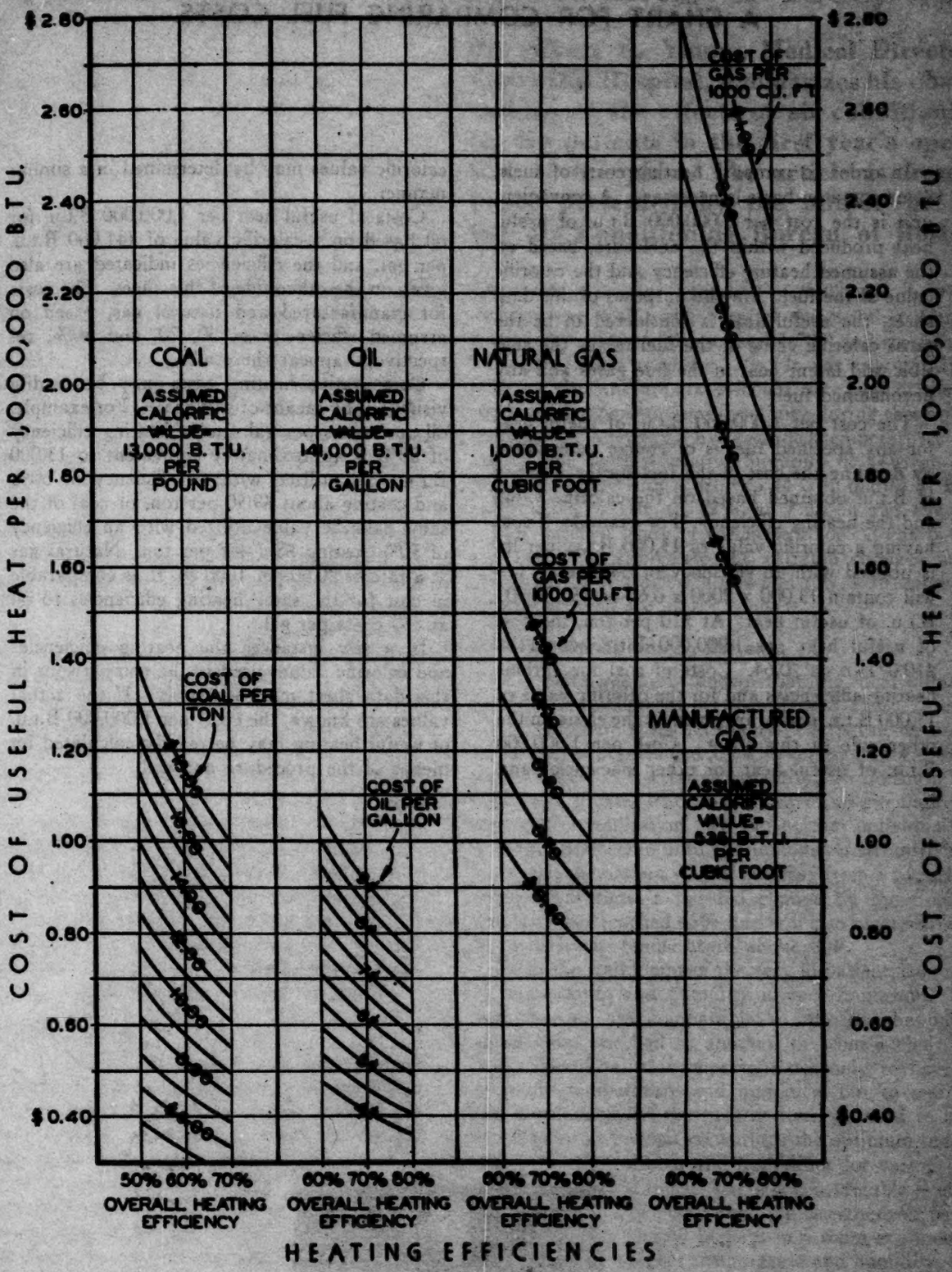
Anthracite Troubles

Latest information available indicates that the tonnage of anthracite coal produced is still falling. The problem has been receiving the continuous attention of Pennsylvania officials where the situation in the producing regions is a matter of much concern. The governor of that state has openly stated that he regards the industry as being retarded by monopolistic practices and by bad financing. He feels that high price has been no small factor in the steady decrease of the anthracite tonnage mined.

Much of the anthracite mined has always been used for firing residence heating plants. Its relative cleanliness in use as compared with other solid fuel was long its best talking point. Along came oil at competitive prices and much of the attractiveness of anthracite disappeared. Gas also began to make its competition felt. Automatic anthracite-using devices have helped anthracite in the battle to retain its place as a residence fuel.

In any attempts to explain the present troubles of anthracite or to predict its future no one should lose sight of the fact that bituminous coal is also now in position to use automatic devices. These devices are capable of removing many of the advantages which anthracite undoubtedly possessed when hand-firing methods were used. It looks very much as if eventually anthracite will have to approach bituminous in price in order to offer equal appeal to the purchaser who uses an automatic stoker. Perhaps it will shortly become apparent that the automatic stoker offers more potentialities to the bituminous fuel than it does to anthracite so long as bituminous reaches the user at prices lower than anthracite.

A CHART FOR COMPARING FUEL COSTS



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H. & V.'s REFERENCE DATA—119

A CHART FOR COMPARING FUEL COSTS

In order to compare heating costs of fuels, some common basis is necessary. A convenient unit is the cost per 1,000,000 B.t.u. of useful heat produced within the enclosure, based on the assumed heating efficiency and the calorific value of the fuel. For the purposes of this data sheet, the useful heat is considered to be the gross calorific value of the fuel minus the sensible and latent heat in the flue gases and any unconsumed fuel.

The cost per 1,000,000 B.t.u. of useful heat for any specified fuel is of course determined by dividing the cost of the fuel by the number of B.t.u. obtained based on the calorific value and the heating efficiency. For example, if coal having a calorific value of 13,000 B.t.u. per lb. is utilized with an efficiency of 60%, each ton will contain 13,000 x 2000 x 0.60 or 15,600,000 B.t.u. of useful heat. At $10 per ton, the cost of useful heat per 1,000,000 B.t.u. would be $10.0/15.6 or $0.64. Costs of coal for various heating efficiencies and for the calorific value of 13,000 B.t.u. per lb. are given on the chart on the other side of this sheet. Cost per 1,000,000 B.t.u. of useful heat for other efficiencies and calorific values may be determined in a similar manner.

Costs of useful heat per 1,000,000 B.t.u. for oil based on a calorific value of 141,000 B.t.u. per gal. and the efficiencies indicated are also given on the other side of this sheet. The costs for manufactured and natural gas, based on assumed efficiencies of 60, 70, and 80%, respectively, appear there also.

Comparative heating costs may be readily visualized by means of this chart. For example, oil at 7 cents per gal. and a heating efficiency of 80% is approximately equivalent to 13,000 B.t.u. coal utilized with an efficiency of 60% and costing about $9.50 per ton, or coal of the same calorific value utilized with an efficiency of 50% costing $8 (+) per ton. Natural gas at a rate of $0.60 per 1000 cu. ft. is comparable in cost for the same heating efficiencies to oil at 8½ cents per gal.

In a few instances the heating efficiencies and calorific values used in the comparisons in this data sheet may not apply. If the actual values are known, the costs per 1,000,000 B.t.u. of useful heating may be readily calculated by means of the procedure outlined.

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A year ago Corey Hill Hospital, Boston, was air conditioned. In this article

The Results of Air Conditioning a Hospital

Dr. Albert G. Young, Medical Director, Corey Hill Hospital, summarizes his observations on the effects of air conditioning on the patients in the first year's operation of the plant. The article is from a paper presented by the author before the Air Conditioning Bureau of Boston.

ABOUT one year ago the Corey Hill Hospital was opened as the first completely air conditioned hospital in the country.[1] In deciding to air condition the hospital, the specifications called for a relative humidity of 30% at all times and temperature control that would maintain a temperature of 75F in sub-zero weather and not more than 80F when the outside temperature was 95 to 100F.

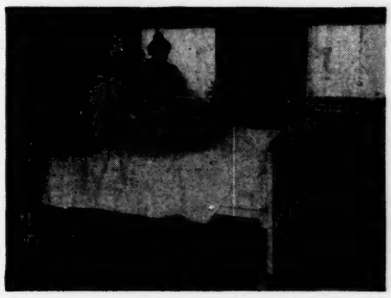
The System

These were rather exacting requirements and some engineers were frankly skeptical of the possibility of maintaining such a low relative humidity in the Boston area. It was finally decided that the system should consist of a combined cooling and absorption system, the cooling being done by refrigeration and lithium chloride used as the absorption medium.

Each room was supplied with air through an ejector type unit. Because of odors and the psychological hazard, it was decided not to recirculate any air, but to exhaust it from each room. For the sake of control of the temperature, a steam coil was included in each of the ejector units so that the patients could add heat to the room if desirable. The operating suite constituted one zone, because it is necessary to have a higher temperature and higher humidity in the operating rooms than in the rest of the hospital. The wings were divided into separate zones so that the temperature of the area could be adjusted, depending upon the location of the sun and the amount of heat due to direct sunlight.

Operating Performance

The winter of 1936-7 was warm and damp, which required considerable dehumidifying. It is interesting that with the doors and windows double sashed, patients had very little conception of what the outside weather conditions really were. However, the greatest test of the equipment took place in the summer of 1937, since that season was very warm and humid. During this time, in spite of the fact that outside temperatures went as high as 99F, with the relative humidity 55%, and a few days later as low as 62F, with a relative humidity of 94%, the recording thermometer within the hospital showed that temperature of the rooms did not exceed 78F and the relative humidity did not go above 33%. It was very gratifying to know that the apparatus could take care of the extremes of temperature and humidity during these quick changes. In August we had recorded temperatures outside of 98F, with a relative humidity of 84% at 7:30 in the morning, with a drop to 44% humidity at noon followed by a rise to 72% at 7:30 in the evening.



It is only by study of the meteorological charts that one can fully appreciate the extreme changes which take place within a few hours and this is all-important to patients who are ill.

Effect of Conditions on Patients

It is quite generally known that the ideal humidity for most individuals is between 25 and 35%. In going below this there is no detrimental effect, but we do not know the value attained by a lower humidity. When we go above 35% relative humidity, we do know that it places a greater load on the heart and circulation, as well as the respiration. To the normal individual this is hardly noticeable until the humidity reaches 65% or more, but the patient who is suffering from a circulatory disease will show a decided change by the time the humidity has reached 45% and will also react adversely to increases in temperature above 80F.

From the standpoint of the very ill patient, constancy of temperature and humidity is very important. Sudden changes are comparable to moving the patient about from one bed to another, or from a chair to a bed. Therefore, it is important not only to have the optimum temperature and humidity, but to maintain this constantly. At the present time we need to know much more as to what constitutes the optimum temperatures and humidities for various conditions. There is considerable evidence to prove that the anesthetized patient should be kept in a room at somewhat higher temperature and humidity. Such studies would help greatly in preventing surgical shocks. There are many more things we need to know in regard to the relationship of the patient and the atmospheric conditions, and this can only be determined by careful

[1]Described and illustrated under the title "Hospital Conditioning System Gives Wide Variety of Climatic Conditions," HEATING & VENTILATING, February, 1937, pages 27-29.

research work, which I hope will be carried out in the Corey Hill Hospital.

Results of Conditioning

We have been able to make certain clinical observations that were very gratifying. In patients suffering from arthritis and rheumatic fever, we know that a warm, dry atmosphere is beneficial. The patients who were in the hospital during the bad months, such as late winter and early spring, showed definite symptomatic as well as clinical improvement and lost their ability to predict the weather, which is so notorious among patients suffering from rheumatic diseases.

The allergic patients, that is, those suffering from such conditions as asthma and hay fever, have been dramatically benefited by their stay in the hospital. There has been considerable skepticism in regard to treating patients by the use of air conditioning, because it is pointed out that the patient is unable to continue to live in air conditioned surroundings. However true this may be, we have learned that the patients suffering from severe attacks of asthma are resistant to almost any type of treatment instituted at that time. It is only possible to determine what conditions are the most aggravating factors when the patient has been quieted down and is able to breathe somewhat normally. This can only be brought about in the severe cases by an air conditioned environment.

Results with the patients treated in this manner have been uniformly good and about 15% of these patients have been sent home to an air conditioned bedroom. By spending part of each day in an air conditioned environment they have been able to maintain the improvement gained. Many of them are carrying on their normal activities. It is also extremely important to patients who have a history of asthma or hay fever, to be in an air conditioned environment if they have to undergo a surgical operation. Frequently the asthmatic patient who is not suffering from asthma at the time may have an attack precipitated as a consequence of anesthesia. Such a misfortune greatly complicates the surgeon's procedure and is a real hazard in regard to the patient's recovery.

The various members of the hospital staff have commented upon the improvement noted in upper respiratory diseases when the patients are kept in an air conditioned environment. Sinus infections, middle ear infections, pneumonia, etc., have all shown gratifying results that could not be accounted for by the usual medical and hospital procedures. During the hot humid days the ability to control the temperature and humidity within the hospital made it a very important refuge also for patients suffering from heart disease, kidney disease, high blood pressure, and other chronic conditions. It is generally known that deaths reported as a consequence of a heat wave do not occur among people in good health. People who succumb to such heat are invariably those who have some physical ailment. Patients who had suffered an attack of heart failure brought on by the hot, humid weather, improved very dramatically within one or two hours from the time they arrived in the hospital. This was also noticeable in severe cases of high blood pressure and kidney diseases.

Need for Research

These are all clinical observations and must be corroborated by careful scientific investigation. If the air conditioning industry is to develop on a sound basis, it is important to the manufacturers of air conditioning equipment to know what is most valuable to the well individual and what is most valuable to the ill patient. The results we have to date are important because we have learned that it is possible to maintain the physical conditions within the building as previously outlined, and that by maintaining these conditions definite clinical improvement can be obtained for a great many patients.

It is also important to know that the cost of maintaining the air conditioning system does not prohibit its use. Our costs have been higher than they should be, but most of this we can correct. Much more could be done in the way of engineering study to determine what is the most economical method of maintaining such a system. It is quite possible that the dehumidifying equipment will have to undergo a rather drastic change. We believe that substitution of oil for coal will decrease our costs noticeably. It is also possible to improve the conditions by putting awnings on certain windows where the sun strikes in the afternoon.

Physician and Engineer Cooperation

We must look upon this installation as one of a pioneering nature, and try to improve upon it from the standpoint of its performance, as well as operating cost. The air conditioning salesman must work with the physician when he attempts to sell air conditioning to an individual who suffers from an illness which requires an air conditioned environment and it is only by full cooperation of the engineer and physician that the patient will obtain the best results. I am thoroughly convinced that air conditioning is a real adjunct to the hospital treatment of patients, but it must not be looked upon as a panacea; merely as an added tool to help us in our fight against disease.

The Future

It can also be an important adjunct from the standpoint of preventive medicine. It is generally known that the city dweller suffers more from diseases of the respiratory tract than those in the country. Much of this is due to irritating substances which are constantly being poured into the city air. It would be impossible to remove all of this, but filtration of part of it would be a real help to the individual. I believe that the time will come when it will be just as great a crime to pollute the city atmosphere as to pollute the water supply.

We already have schools for crippled children, for the blind, and for the mentally defective; but we do not have schools to take care of the large number of children who suffer from such diseases as rheumatic fever, asthma, hay fever and allied conditions. It would be very simple to have a few air conditioned schools to take care of these children. Certainly they have as much right to an education as the other unfortunates, and properly cared for they would have a better prospect of taking their places in the world when they become adults. I am convinced that the future will bring forth such schools.

WHAT READERS SAY • • •

Moisture in Insulation

It is with much interest that I read . . .Moisture in Insulating Materials . . . on page 57 of your November issue.

It is very true that the time is here when the truth should be known on this subject; and this truth fully recognized, established, and published.

There is in fact no mystery in the matter to any one who gives it proper thought. The phenomena of condensation and its causes are well known and extensively utilized in industry. The action of vapor travel and transformation under pressure difference is as well known. The difference in thermal conductivity of bulk insulating materials in either a wet or dry state is also well known. With this knowledge before us, and further substantiated by visible evidence which can be found almost anywhere in these northern climates in the winter time, there should be no question of what will and does happen, even though it be not immediately apparent.

All bulk insulating materials have at some time or other been tried in cold storage work. Even with the best of them, and when they were installed in a manner far superior to that used in residence or building construction, they progressively and ultimately failed from the cause under discussion. This is a fact that is substantiated by anyone who is at all familiar with cold storage insulation.

There is no fundamental difference between a cold storage room held at — 10F and 0 R.H., when surrounded by air at 70F and 30% R.H. and a building held at 70F and 30% R.H., surrounded by air at — 10F and 0 R.H. In both cases, the temperature and vapor pressure differences are the same, and in both cases the movement and physical transformation of the vapor are the same. Then, if in the one case which is supported by extra good workmanship, there is a known failure, is it not reasonable to expect a failure on the other, where the conditions are the same and the type of workmanship of an inferior class?

For obvious reasons, authoritative laboratories cannot with good grace mention products by name and connect them with reports that would be damaging to an industry. These same authorities, however, have put plenty in print on the subject in general; and of late one of them has been getting very specific.

Following is a partial list of references on the subject, some of which are by no means of recent date:

Bureau of Standards Bulletin 376, page 11, 1934.

Bureau of Standards L.C. 421, 1934.

Federal Coordination of Transportation—Report, 1936.

ASRE Data Book—any edition.

Forest Products Laboratory Bulletin, August, 1936.

Forest Products Laboratory Bulletin, October, 1937.

Another phase of the matter is the damage to structures caused by the moisture accumulations. There has been considerable publicity given to the termite situation, yet there is available ample visible evidence that condensation in walls and ceilings will destroy the structure much faster than any termite infestation. Our City Building Department has a collection of specimens of this damage taken from actual structures in this city. Similar collections, specimens and evidence can be found almost everywhere in these northern climates if one takes the time to look for them.

That the damage is not immediately apparent does not detract from the fact that it is there. To say that it was not there, or not taking place, would be to deny the truth of all known physical phenomena and scientific fact.

Referring to the content of your article: case histories are mostly made when the structures are new and the materials showing at their best. Reports on the same cases after a period of time has elapsed seldom coincide with the original showings. The matter of being adequate for peaks is misleading, as this is more the result of lag and capacity effects after an equilibrium of flow is established than it is of specific thermal gain or loss.

It is a well established fact with those who have dug into the subject that an insulated structure should be effectively vapor sealed on the warm side and adequately vented to the cold side. The venting should be of such character that pronounced convection or flue action is absent.

Much money and effort have been spent on producing the effects of heating, ventilating and air conditioning, but little money or effort on the protection of those conditions after creation. On that phase too much has been taken for granted because of the many materials available and the intensive merchandising programs of the manufacturers. Insulation is a highly technical engineering subject which has not been handled as such. In its sale and use, engineering of a careful nature should be of major importance, and merchandising should be of secondary importance. As matters stand, merchandising is the sole consideration—engineering is entirely forgotten.

The inconsistencies of some of the prominent manufacturers are amazing. Especially so in view of fact that they know better. I have in mind one who floods the engineers and architects with data cautioning against the damage from vapor condensation, and who recently had a full page ad in a magazine that caters to the unintellectual, in which while they did not say it would not happen, they do leave the impression that such is the case. This is expedient rather than logical handling of the matter. It leads to confusion and eventual disrepute for the material, as well as the business. How much better would it be to realize that any material is always open to improvement in construction and methods of handling, and that these improvements are something to be proud of, rather than be ashamed of.—*Fred Organ, Architect, Omaha, Neb.*

ABSTRACTS of Current Papers, Books and Pamphlets

Air Conditioning in Summer and Winter

"Air Conditioning in Summer and Winter" has been written to give men who have no knowledge of air conditioning and only a secondary school technical education a presentation of the science of air conditioning. No attempt is made to give the subject an exhaustive treatment, the main purpose being to furnish the reader with a thorough grounding in the important phases of the subject.

The material has been arranged in a logical order starting with a discussion of the atmosphere and air and water vapor mixtures and continuing with a concise treatment of psychrometry. The requirements for comfort are next discussed and then follows descriptions of various types of systems which are available for achieving these conditions. Thus when the reader has finished the first four chapters he should have a good knowledge of the fundamental principles of air conditioning, what conditions should be maintained, and what types of equipment are available to obtain these conditions.

Winter air conditioning is discussed in the second part of the book, first the method of figuring the air conditioning load and then a more detailed description of the equipment. The last chapter of this section, which is entitled the Application of Winter Air Conditioning Equipment, outlines step by step the method of designing a complete job. The method is illustrated with an actual problem. Just how suitable blowers, filters, heaters, and humidifiers are selected is also explained.

The third section deals with summer air conditioning systems. First of all there is a three-chapter discussion of refrigeration principles, refrigerants, and refrigeration systems. Then the method of calculating the cooling load is explained. Following this is a description of summer air conditioning equipment such as dehumidifiers, condensing equipment, and refrigerating equipment. The third section is completed with a step-by-step explanation of the design of a complete summer cooling job.

This book is an excellent one to recommend to all men who are interested in securing some knowledge of the subject of air conditioning, for it presents all of the more important points without going into such detail as to confuse a beginner. The chapters on the design of winter and summer systems and the one on condensing equipment are especially well done.

[*"Air Conditioning in Summer and Winter," by Richard E. Holmes. Published by McGraw-Hill Book Co., New York. Cloth bound; 6 x 9 in.; 296 pages; price, $3.*]

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Ventilation at the Anthracite Collieries

This paper is one of a limited series being prepared by the Bureau of Mines to supplement a more extensive series on mining and preparation methods in the various mining districts of the United States. It describes ventilation methods and practices at the anthracite collieries in the northern field of the anthracite measures of Pennsylvania as obtained by personal inspections in twenty of the larger collieries during 1933 and 1934 and from supplementary information furnished then and later by operating officials.

The three largest collieries in this region produce an average of 5000 to 6500 tons a day with 1600 to 1800 employes underground on one or two shifts, and require a million or more cubic feet of ventilating air per minute each, or the equivalent of somewhat more than nine tons of air per day per ton (2240 lb.) of coal produced. The average large colliery produces 2500 to 4000 tons a day and requires four to five hundred thousand c.f.m. to ventilate it.

It is estimated that fans circulating more than 25,000,000 c.f.m. are operating continuously and that the yearly cost of ventilation is something like $3,500,000. The magnitude of the ventilation problem in this field is apparent, therefore, and represents more air mechanically handled than for all of the metal mines of the United States, Canada, and Mexico combined.

[*"Ventilation at the Anthracite Collieries of the Northern Pennsylvania Field," Information Circular 6965, by G. E. McElroy. Published by the United States Bureau of Mines, Washington, D. C. Paper cover; 8½ x 11 in.; 24 pages; mimeographed.*]

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BRIEF REVIEWS

British Refrigeration Manufacturers. A combined catalog and handbook of British refrigerating products. It contains a list of refrigeration materials and their manufacturers, catalog of materials, a list of standard works on refrigeration and a 17-page technical section. [*"Handbook of British Refrigeration Material and Refrigeration Catalog, 1938," published by the Cold Storage and Produce Review, Empire House, St. Martin's-le-Grand, London. Heavy cardboard cover; 200 pages; 7½ x 10 in.; price, 5s. 9d.*]

Tubular Heat Exchangers. Standards of the Tubular Exchanger Section of the Heat Exchange Institute covering mechanical, construction, and thermal standards for shell and bare tube heat exchangers. The standards contain data on exchanger shells, tube sheets, baffles, support plates, tubes, material specifications, fouling factors, and thermal design data. [*"Tubular Exchanger Section of the Standards of the Heat Exchange Institute. Paper cover; 42 pages; 8½ x 11 in.; copies obtainable from C. H. Rohrbach, secretary, 90 West St., New York; price, 75c.*]

Heat Transmission. A very limited amount of published data relating to individual film coefficients of heat transmission from metal surfaces to boiling liquids is available. Most of this information has been obtained for water at its normal boiling point. In this study film coefficients were determined for eight different liquids at boiling points both above and below atmospheric

(Concluded on page 68)

NEWS OF THE MONTH

50% Indoor Humidity Gives Trouble, Holt Tells Building Operators

BOSTON—Attempts to maintain a relative humidity of 50% in residences have brought grief to many homeowners due to the forming of condensation on windows and walls, according to Prof. James Holt of Massachusetts Institute of Technology, speaking before a recent meeting of the Building Owners and Managers' Association here.

Professor Holt said:

Of the many systems available for heating residential property, the greatest interest seems to be in the direct and indirect warm air systems, due to their particular adaptability to the functions of air conditioning—control of temperature, humidity, air motion, and air purity, and to the large number of units of this type with automatic heating equipment available on the market.

From the notebook, after visiting a large number of these properties, three problems seem to be outstanding. First, difficulty in heating rooms remote from the heating plant, particularly rooms over garages; this is serious with direct fired plants, but has been fairly satisfactorily handled by indirect systems through the use of radiators in remote rooms and careful insulation of ceiling and floor.

Second, cold 70. Most of the systems are intermittent in operation, both as to source of heat and circulation of air. During the off period the circulation through the unit practically ceases and the cooler air, seeking lower levels, stratifies at the floor, leaving a cold blanket of air about the feet, even though the thermostat may be set as desired. The control manufacturers can supply controls which can solve this problem, but I find it a common problem in many homes.

Third. Many homeowners have been sold on the benefits of humidification, so that they try to maintain relative humidities in the neighborhood of 50%, which has brought grief in the form of condensation on windows, walls, and, what is perhaps more serious, within the walls themselves, especially within insulated walls. We have no justification for this high humidity, and in my opinion 30% is high enough, when the grief in most cases will be eliminated.

Harding Made Public Works Head

BUFFALO—L. A. Harding, well-known as a consulting engineer and president of the L. A. Harding Construction Corporation, assumed the office of Commissioner of Public Works of Buffalo the first of January.

W. H. Stangle talks on oil burners at the Westinghouse sales meeting

Westinghouse Holds Sales Meeting; Stangle Analyzes A. C. Market

MANSFIELD, OHIO — Westinghouse dealers from Michigan, Ohio, Pennsylvania, and West Virginia attended an enthusiastic sales convention of Westinghouse Electric and Manufacturing Company's air conditioning division held here January 10-11. The purpose of the meeting was to introduce the company's new line of air conditioning products.

The speakers included W. H. Stangle, assistant to the manager of the air conditioning and refrigeration division, who is in charge of the new home air conditioning sales activities for the company; H. F. Hildreth, of the sales department; R. E. Imhoff, who spoke on Packaged Air Conditioning; P. Y. Danley, whose subject was The Industry Position of Westinghouse; S. F. Myers, who discussed Matched Equipment for Summer Cooling; George Park, who spoke on How to Get Prospects; Jesse Lide, who spoke on how the dealer should be "Organized to Handle Prospects"; R. H. Bolin; Tom Kalbfus; J. E. Hugo; W. J. Smith; L. G. Huggins and P. J. Zilles.

In his address Mr. Stangle said that the company's study of the air conditioning market showed that the average annual one-family house market is about 280,000 units for a normal year, ranging from a low of 41,000 in 1934 to an all-time high of 546,000 in 1925. This market Mr. Stangle broke down into various price brackets and from this predicted the volume markets based on past performance. For example, for houses costing below $5000 (values including cost of land) only simple heating systems could be afforded, but winter air conditioning can be provided for houses in the $6000 and $7000 brackets, while all-year-round conditioning can be provided for the houses costing from $8000 up. On this basis Mr. Stangle estimated the total amount of money spent for such systems for a normal year and on the basis that one-third of the installed cost goes to the manufacturer, the average annual saturation is about $85,000,000 for one-family house air conditioning in a normal year.

In addition to this the rehabilitation of old house heating systems amounts to about $21,000,000 with the total anticipated market being about $100,000,000 in a normal year.

Federal Public Works Bureau Urged by Civil Engineers at Convention

NEW YORK—The creation of a Federal Department of Public Works as a new separate branch of the government was urged by civil engineers attending the 85th annual meeting of the American Society of Civil Engineers held here in January.

The history of the movement to establish a Federal Department of Public Works was discussed by Alonzo J. Hammond, consulting engineer, Chicago, and past president of the society. George W. Burpee, New York consulting engineer, presented the reasons for creating such a department. Donald H. Sawyer, chief of the Section of Space Control, Procurement Division, Treasury Department, Washington, discussed some factors influencing the establishment of the new department.

The functions of the new department, Mr. Hammond said, would be to coordinate and effect economies in the ramified building of the government, which is now scattered through many departments. Virtually every type of building by the government, except the military works of the War Department, would be in the province of the new branch.

Past surveys indicate, according to Mr. Hammond, that about $50,000,000 might be saved for every billion dollars spent for public works by a unified and coordinated control.

Mr. Hammond listed prominent engineers and government agencies that have advocated such a department, including former President Hoover, a committee on government organization appointed by President Harding in 1922, and the committee appointed by President Roosevelt to study administration management.

He predicted that the proposal to create the new department would receive serious consideration when Congress acted on President Roosevelt's plan to reorganize the Federal Executive Department. The growing importance of public works, he said, "fully justifies" inclusion of a new officer in the Cabinet, who would be "a distinguished member of the engineering profession, just as the Attorney General is always a distinguished member of the legal profession."

California Group Hears A.C. Talks

LOS ANGELES—The Southern California chapter of the ASHVE met December 14 with President E. H. Kendall presiding. The principal guest and speaker was E. F. Dawson, professor of mechanical engineering at the University of Oklahoma. He spoke on "Refrigeration, Refrigerants and Air Conditioning." Professor Dawson's address was well received and paved the way for future interesting programs furnished by the speakers bureau. Following this there was a discussion by the members and guests of whom there were 95 present.

One hundred members and guests of the ASHVE and ASRE met in joint session January 18. Vice-President H. M. Hendrickson presided in the absence of President Kendall, who was in the east to attend the annual meeting.

Herman Seid, patent and engineering counsel for the Auditorium Conditioning Corporation, spoke on "Patented Systems of the Auditorium Conditioning Corporation." As well as discussing the patent situation, Mr. Seid digressed from the subject to give some idea of the trend of regulation that is being proposed in the east, especially in Washington, D. C.

Sell 66,427 Tons of Packaged Fuel

WASHINGTON—The packaged fuel industry has developed into a healthy infant. The Bureau of Mines reports that sale of the fuel—which may be stacked in the living room closet—began in a small way in 1932 and last year reached 66,427 net tons.

Packaged fuel is produced at retail yards, usually from what is left over from handling the coarser sizes of coal. The packages consist of six cube-shaped briquets wrapped in heavy paper and bound with paper tape.

Crane Issues Talkie on "Flow"

CHICAGO—How valves and fittings give mankind control over liquids and gases is revealed in a sound picture entitled "Flow" just released by Crane Company. Scenes of rivers in flood, waterfalls, and primitive means of controlling flow are followed in the picture by an educational tour through the Chicago Works of the company, where the various steps in manufacturing with iron, brass and steel are revealed.

T. Kimball Joins Film Producer

NEW YORK—Terry Kimball, formerly with Gar Wood, has joined Mason Wadsworth, New York and Hollywood producer of business films, as account representative to automatic heat and air conditioning clients.

Advertisers Plan Meeting in Ohio

CLEVELAND—The National Industrial Advertisers Association will hold its 16th annual conference here, September 21-23. Stanley Knisely, advertising manager of Republic Steel Corporation, who, as vice-president of the association, heads its committee for conference program and arrangements. Last September at Chicago the association surpassed all its former attendance records with a registration of almost 800.

F. O. Wyse, advertising manager of Bucyrus-Erie Co., South Milwaukee, who at that meeting was elected NIAA president for the current year, characterized the whole year of 1937 as the busiest year of growth and expansion of activities in the association's history, since its formation in 1922.

Three new chapters were added—Toledo, Toronto, and Indianapolis—and a dozen different research and development projects were carried on in addition to the separate activities and monthly meetings of local chapters now being held regularly in 15 cities.

Stanton Discusses Noise Problems

NEW YORK—The problem of noise in ventilation was outlined and the methods of approach to its solution described by G. T. Stanton, manager, technical consulting department, Electrical Research Products, Inc., at the January 17 meeting of the New York Chapter, ASHVE.

Mr. Stanton, who acted as consultant in connection with acoustical problems in the design of the Lincoln Vehicular Tunnel in New York, defined noise in simple terms as the variation of pressure in the ear. He listed several methods of obtaining noise reduction, among which are (1) decreasing the resistance of vibrating parts; (2) reducing the forces which cause vibration; (3) reduction of the area in vibration, and (4) reducing the transmission of vibrating forces. In some types of electrical equipment it has been possible to set up sound waves in opposition to troublesome noises so that the two are out of phase and destroy each other. This, however, is not practical in mechanics.

Methods for reducing the resistance of vibrating parts, reducing the vibrating forces, and reducing the area in vibration are all problems of the machine designer and usually must be taken care of before the apparatus reaches the field. In the field it is possible to reduce the vibrating forces that reach parts of the machine or system which are free to vibrate. One way of accomplishing this is, for example, to introduce springs between the vibrating force and the transmitting parts.

To illustrate this the speaker described the action of a weight suspended from a spring with the vibrating force acting from above. If the force vibrates vertically, increasing in amplitude, the vertical motion of the suspended weight becomes greater and greater. Depending on the degree of "softness" of the spring the amplitude of the weight will reach a point of resonance with the force. If the spring is soft this point will be passed as the frequency increases and the amplitude considerably dampened. On the other hand, if the spring is relatively stiff the weight will remain in resonance with the spring. Consequently, when a machine is mounted on springs they must be soft enough to allow the suspended weight to pass through the critical point some time during the starting-up period so that the vibration will be dampened when the machine reaches its speed, even though the vibration is relatively high at some time during the starting-up period.

The speaker cautioned his audience that in using acoustical material for sound absorption in ducts, the ducts must not be too large in cross-sectional area relative to the wave length of the sound being transmitted. If the duct is large the acoustical material should subdivide the duct into a number of smaller sections since sound tends to travel along the center line of the duct, and by breaking up the duct the transmitted sound is also broken up.

In response to questioning Mr. Stanton said that canvas connections from fans to ducts need not be more than a fold or two in length, but that painting such canvas with heavy metallic paints may increase the sound transmission through the canvas sharply. The canvas should be soft.

N.Y.Contractors Plan Supper-Dance

NEW YORK—A supper-dance and entertainment on the night of February 21 is announced by the Association of Plumbing and Heating Contractors of Greater New York, Inc. This occasion has become an annual affair with this organization and this year's party at the International Casino, 45th Street and Broadway, is the fourth time the event has been held. As in previous years it is the occasion when the member contractors entertain their guests.

Officers of the association are P. Wolf, president; J. Kessler, vice-president; B. Spiegel, treasurer; J. C. Weare, secretary.

Herske on Sales Executives Board

NEW YORK—At a meeting of the board of governors of the International Association of Sales Executives, Inc., held here December 30, Arthur R. Herske, vice-president of the American Radiator Company, was made a member of the board of directors.

Extension Courses in Conditioning Continued by Massachusetts

BOSTON—University Extension courses conducted under the sponsorship of the State Department of Education have been expanded this winter, with continuation of instruction in heating, ventilating, air conditioning and refrigeration, together with oil burners in special courses.

P. A. L. Foulds, consulting engineer, is conducting a course in practical air conditioning for stores, restaurants, residences, and offices on Thursday evenings, with a series of eight lectures dealing with equipment and calculations.

John E. York, mechanical engineer, of Stone & Webster, has class Wednesday evenings for eight weeks on air conditioning calculations and design, planned for men who are familiar with the fundamentals of heating, ventilating, or air conditioning.

Charles A. Cummings, sales engineer, Minneapolis-Honeywell Regulator Company, conducts Tuesday evening class in automatic controls for heating and air conditioning.

Mr. York is also conducting on Monday evenings a course in Heating and Ventilating, which is also offered by correspondence. This consists of 16 lectures and is planned for men in the trade who handle installation, design, maintenance, and selling of heating apparatus and systems.

Two other courses, on apartment house heating for owners and managers and apartment house heating for janitors and superintendents, are supervised by Joseph Greenblatt, consulting engineer. They meet Tuesday and Wednesday evenings, respectively.

W. Albin Johnson, consultant on oil heating, is giving a course on oil burners Thursday evening with eight lectures and one on building and home insulation Tuesdays, also with eight lectures.

Leon F. Carton, installation and service supervisor and engineer with the General Motors Sales Corporation and instructor in refrigeration, is giving a course in commercial refrigeration Friday evenings, covering design, installation, and maintenance of various types of refrigeration from the serviceman's viewpoint.

All these courses are given in various rooms at the Massachusetts Institute of Technology.

50 New A.C. Cars for New Haven

BOSTON—The New Haven Railroad plans to spend $2,850,000 through an equipment trust for some fifty additional lightweight, air conditioned, streamlined coaches and ten additional locomotives. The coaches would cost an estimated $2,100,000, and will bring the total of conditioned coaches owned by the New Haven to 200.

Daniels Honored by Boston Bureau

BOSTON—Members of the Air Conditioning Bureau elected officers at the fifth annual business meeting January 20, in the Boston Chamber of Commerce, and celebrated President's Night with friends and invited guests. Officers elected were: president, H. R. Sewell, Cooling and Air Conditioning Div., B. F. Sturtevant Co.; vice-president, Rudolph Sommers, vice-president of Boston Ice Co.; treasurer, E. D. Johnson, sales agent for Buffalo Forge Co.; secretary, Daniel Ricker, Boston Edison Co.; directors, L. E. Gardner, General Heat & Appliance Co., and S. T. Smith, Gar Wood Industries.

Invited guests and speakers included Willis H. Carrier, chairman of the board, Carrier Corp.; Frederick H. Bliss, president, Engineering Societies of New England; and Edward H. Roemer, building commissioner of Boston.

Following the speakers, the meeting resolved into a testimonial to the retiring president, Julius Daniels, who has headed the organization since its inception, four years ago. The testimonial took the form of a pageant.

Mr. Daniels, who has seen the Bureau grow from a membership of 25 and helped it expand to its present membership of 200, was presented with a handsome desk set and a desk cigar lighter. Another gift, which evoked much laughter, was carefully wrapped in ribbon and cellophane and proved to be an ancient street warning lantern. This was in recognition of Mr. Daniels' collection of ancient lamps and other lighting pieces.

Jaros Teaches Conditioning Course

NEW YORK— New York University School of Architecture and Allied Arts, 1071 Sixth Ave., announces a course in air conditioning to be given by Alfred L. Jaros, consulting engineer. The course includes factors determining capacities, type, and arrangement of equipment, computation of quantities, layout, performance, guarantees, and other phases of this subject. It is given on Wednesday evenings, from 8:05 to 9:50. The first class met Wednesday, February 2. The fee is $25, payable in advance.

Boston Burner Group Elects Lordan

BOSTON—Officers of the Boston Oil Burner Associates for 1938 were elected at the annual business meeting January 11, as follows: President, John Lordan; vice-president, Henry Brody; secretary-treasurer, Frank Hawkins; executive committee, John D'Arcy and Charles Dennis. Plans are under way for a Firechiefs' Night to be held some time in the spring, at which the firechiefs of metropolitan Boston will be guests of the associates.

Schellenberg Talks to Illinois Group

CHICAGO—A. B. Schellenberg, Alco Valve Co., Inc., St. Louis, Mo., spoke on "Automatic Control of Refrigeration" at the December 13 meeting of the ASHVE Illinois chapter. Eighty were present.

Because of the wide range of the subject, Mr. Schellenberg confined his discussion to automatic control devices used to regulate flow of the refrigerant and more specifically to the thermostatic expansion valve. He covered briefly the constant pressure expansion valve, high pressure float valve, low pressure float switch, and magnetic stop valve, and explained the thermostatic expansion valve in detail.

In operation for further study was a demonstrating glass evaporator, hooked up with a small compressor and fed by a thermostatic expansion valve. With this demonstrator it was possible to show exactly what happens inside an evaporator under many different operating conditions. Mr. Schellenberg's talk was received with great interest, and appreciation for its thoroughness and informativeness was recorded in a rising vote of thanks.

A report of a special chapter committee, consisting of Messrs. Hattis, Brooke and Vernon, on a proposal to organize an Illinois Engineering Council, was given by Mr. Hattis. Such a council would consist of all professional engineering organizations in the Chicago district and would function on general legislative and other matters of common concern to all. Mr. Hattis reported that the idea was endorsed in principle by the representatives of the various engineering organizations attending the special meeting called for its consideration, and a committee was appointed to draft a prospectus and present details for further study by the different groups.

Tom Brown and Otto Armspach were unanimously elected treasurer and member of the Board of governors, respectively.

Prof. Allcut Talks on Insulation

TORONTO, ONT.—The joint meeting of the ASHVE Toronto chapter and the Engineering Institute of Canada, held recently at the Royal York Hotel, was attended by 168 members and guests.

The chief speaker, Prof. E. A. Allcut of the University of Toronto, was introduced by E. Holt Gurney. Professor Allcut gave an illustrated address on "Heating Insulating Materials and Their Properties."

J. Ellis, Prof. Harry Angus, and C. Tasker spoke on behalf of the Engineering Institute of Canada, the ASME, and the ASHVE, respectively, on the advantages of joint meetings. It was decided that the three societies have a joint meeting again.

Dewey Heads Oil Burner Institute

NEW YORK—C. N. Lockwood resigned as president of the Oil Burner Institute at a meeting of the board of directors here January 25. Mr. Lockwood tendered his resignation because of temporary severance with the industry.

Frank H. Dewey, general manager of the air conditioning division of Gar Wood Industries, was elected president to succeed Mr. Lockwood.

A concerted drive for manufacturer and associate members will be begun shortly in conjunction with a resolution to reduce dues 25% which passed the board at the meeting. It is hoped to secure all major manufacturers in the industry.

Frank E. Spencer of the Chicago Oil Heat Committee reported on his plan asking $3,000,000 from the oil companies for a three-year campaign to promote oil heating.

Allen Plans Off-Peak Electric Job

KEMPTVILLE, ONT.—Possibly the only heating system of its kind in Canada is that recently installed by W. A. Barnes & Sons, heating contractors, for heating the local municipal building. The system, entirely automatic, uses off-peak electric power from the local utility.

A. Walter Allen, Ottawa, heating engineer for the Pease Foundry Co., Ltd., designed the system according to his own plans. It is of the hot water type, and has proved highly satisfactory.

Wiggs Addresses Montreal Group

MONTREAL, QUE.—Fifty members and guests attended the recent meeting of the Montreal chapter of the ASHVE held in the Mt. Royal Hotel.

The featured speaker was G. L. Wiggs, consulting engineer of Montreal and president of the Montreal chapter. The subject of the talk was "Air Conditioning in the Mount Royal Hotel." Mention was made regarding interesting problems which had arisen in operating the systems since their installation. Following the lecture, which was well illustrated by photographic slides and diagrams, a tour of inspection was made.

Utilities Report on Summer A.C.

NEW YORK—Final figures on air conditioning installations added to the lines of four utility companies in 1937 are as follows:

UTILITY	1936		1937	
	No.	HP.	No.	HP.
Birmingham Electric Co.	44	594	61	1655
Kansas Gas & Electric Co.	141	747	138	1024
Public Service Co. of New Hampshire ..	22	53	34	55
Mississippi Power & Light Co.	45	198	51	372

O'Day Speaks to ASME Juniors

NEW YORK—One of the largest gatherings of the season attended the Junior Air Conditioning Seminar of the metropolitan section of ASME here January 18 when C. N. O'Day, Preferred Utilities Company, Inc., was the principal speaker. Mr. O'Day has had a long experience in the heating and ventilating field, having been formerly associated with Buckeye Blower Company, and with control manufacturers in the application of their controls, especially in the schoolhouse field.

Mr. O'Day held the close attention of the gathering for over an hour while he described the principles on which electrical controls are used to control the automatic operation of air conditioning plants. He also illustrated equipment suitable for the purpose and showed by a typical diagram how individual control instruments can be assembled into a complete plan for securing full automatic operation. S. Davidson, Armo Cooling & Ventilating Company, Inc., chairman of the Seminar, presided and led a lively discussion at the close of Mr. O'Day's talk.

Puerto Rico Bank Air Conditioned

SAN JUAN, P. R.—The tallest building in Puerto Rico, the Banco Popular de Puerto Rico Building, will be the first completely air conditioned building in the Carribean area upon the completion of an installation in the 10-story structure.

This $450,000 building consists of the bank, which includes the basement, main floor, and mezzanine, and eight office floors. Architecture is of modern design and is specially designed for the maximum in window space.

The year-round air conditioning system for cooling and humidity control is divided into separate units. The main banking spaces and the first office floor are conditioned from a central plant in the basement. The other floors receive conditioned air from 50-hp. compressors and separate units.

Chile Has Conditioning in Morgue

SANTIAGO, CHILE—Air conditioned refrigeration for the body freezing, storage and display rooms of the Government Medical Center morgue has been installed by the Institute Medical Legal.

Temperatures of 3F are maintained in the body freezing room, 21F in the frozen storage room, and 23F for the body display quarters. The last has glass windows in front for observation purposes.

Warm Air Short Course Scheduled

EAST LANSING, MICH.—The 8th annual Forced Warm Air Short Course will be held at Michigan State College here March 28-31. From the opening address by President Shaw on Monday at 11 a. m. to the sales sessions on Thursday, it will be packed with interesting and instructional meetings. Combustion, soil temperatures, insulation, air movement, controls, filters, and degree-day estimating are some of the subjects promised by nationally known speakers.

The group will be divided into three parts: beginners, experienced designers of forced warm air heating plants, and designers of cooling systems.

Ample rooms, reasonable meals, and nominal registration fee are promised.

Further information may be obtained by writing to Prof. L. G. Miller, mechanical engineering department, Michigan State College, East Lansing, Mich.

Massachusetts May Have Sales Tax

BOSTON—A bill has been introduced in the Massachusetts legislature providing for a 2% tax on retail sales of all tangible personal property. Apparently, this would apply to sales at retail of everything, from a paper of pins to an oil burner or air conditioning unit.

Conditioned Kennels for Stray Dogs

WINDSOR, ONT.—The first humane society in Ontario, possibly Canada, to have air conditioned kennels for stray dogs, is the Essex Humane Society which opened one recently.

Fairbanks-Morse Distributors Meet

NEW YORK—The Fairbanks-Morse line of self-contained unit air conditioning equipment was featured at a meeting of dealers and distributors from New York and New England held here January 20.

During the all-day meeting at the Hotel Roosevelt, Fairbanks-Morse executives and managers presided at the display of the new equipment, explained the Fairbanks-Morse engineering and selling policies while A. L. Decker of the advertising agency for Fairbanks-Morse outlined the publicity campaign for 1938 which is to accompany the sales program.

J. W. Bostwick, manager of the air conditioning division, T. M. Drennen, New York manager, G. A. Hawkins, Boston manager, and H. A. Dunton, New York manager, took part in the program.

The Fairbanks-Morse line of self-contained units for 1938 includes models ranging in capacity from 5 tons of refrigeration to 7000 B.t.u. per hr. in capacity.

Hopeful for Alabama Coal

BIRMINGHAM, ALA.—The Alabama coal industry is hopeful of regaining much business lost in recent years to fuel oil and natural gas as a result of the recent extension of a 9-ft. channel 85 miles up the Warrior River to rich coal fields of the De Bardeleben Coal Company and other companies. The improved water-way was made possible by raising the crest of Lock and Dam 17 by some 12 ft., this work being done by the U. S. War Department at a cost of $449,000.

"Alabama coal had been driven out of the Mobile and Gulf Coast territory by fuel oil and natural gas," explained Charles F. De Bardeleben, president of the De Bardeleben Company. "We have lost to oil and natural gas since 1930 more than 3,000,000 tons a year in outlet. With the Warrior River now open for 85 miles through the coal fields, we have every reason to believe we will regain 300,000 tons of this business during the first year."

Mr. De Bardeleben explained that railroads had been unable to make a rate from Birmingham to Mobile which would enable coal producers to compete with oil and gas but that water transportation will cut the rate in half and enable coal companies to undersell oil and gas on the basis of equivalent heat production.

Committee of Ten to Issue Bulletins; Stoker Standards Considered

CHICAGO—At the recent annual meeting of the Committee of Ten, Coal & Heating Industries, held in Chicago, Chairman J. C. Cosgrove stated that the manual committee will be charged with the duty of assembling, preparing, and editing additional technical and semi-technical bulletins and reports in continuing the series of educational bulletins published a few years ago. It was announced that the material for several additional bulletins had been assembled, as well as data for revising several of the committee's most popular and helpful bulletins in the series.

The joint service committee, headed by H. M. Hart, will continue with studies of the many jurisdictional problems involved in the furnishing of solid fuels and merchandising of coal-burning equipment.

The research committee, headed by J. H. Walker, which has been active in assembling data on coal and coals' allied industries, will undertake to make some recommendations concerning applied research studies especially with reference to stoker firing and sizes of stoker coal.

Meetings of several of these committees will be held in Chicago during the next several months. Some of the work of the research committee is being coordinated with the committee on standards of performance under Bituminous Coal Research, Inc. This work involves the preparation of standards covering the testing of small underfeed stokers for approval purposes by the bituminous coal industry and it is expected that these standards will be ready for adoption by the research corporation early this year.

The following appointments to the standing committees for the ensuing year were announced: manual committee: J. Harvey Manny, chairman, W. B. Hughes and R. A. Miller; joint service committee: H. M. Hart, chairman, M. E. Robinson, Jr., and Jack Stowell; research committee: J. H. Walker, chairman, J. M. McClintock and Ben L. Boalt; membership committee: L. H. Dayhoff, chairman, R. A. Miller and W. J. O'Neil; finance committee: H. H. Kurtz, chairman, L. H. Dayhoff and Marc G. Bluth.

U. S. Housing Authority News

The following appointments to the staff of the Authority were announced January 7: J. A. Latimer as assistant to the Administrator; W. J. Vinton as acting chief of project review; J. L. Crane as acting director of the project planning division; and A. C. Shire as acting director of the technical division.

Mr. Latimer's home is in South Carolina where, for many years, he was identified with various aspects of the cotton business. Later he entered the newspaper field; in 1930 he came to Washington as secretary to Senator James F. Byrnes. In 1933 he was made secretary to Postmaster General Farley and became Special Assistant to the Postmaster General in February, 1934.

Mr. Vinton was formerly chief of research for the division of suburban resettlement in the Resettlement Administration. He was formerly director of the Vinton Co., Detroit. He has also served as director of research for the American Association for Social Security and research supervisor for FHA.

Mr. Crane is consulting engineer and city planner of Chicago. He was in the U. S. Housing Corporation during 1917 and 1918, and later consultant for the National Resources Committee, FHA, and Suburban Resettlement.

Mr. Shire, a mechanical engineer, began his government service as engineer for the housing division of PWA. When FHA was formed he became chief engineer.

* * *

Federal funds totaling $10 million to be used for large-scale slum-clearance and low-rent housing projects were earmarked January 12 for eight additional cities. This increased the total funds set aside for 40 cities to over $146 million of the $300 million to be made available during the next two years.

Earmarkings as of January 12 are:

STATE & CITY	AMOUNT EARMARKED	STATE TOTAL
Alabama		
Birmingham	$4,500,000	
Mobile	1,400,000	$5,900,000
Connecticut		
Bridgeport	3,600,000	3,600,000
Florida		
Jacksonville	1,000,000	
St. Petersburg	900,000	
Tampa	1,500,000	3,400,000
Georgia		
Augusta	1,125,000	1,125,000
Illinois		
Chicago	16,000,000	
East St. Louis	1,500,000	
Peoria	1,500,000	19,000,000
Indiana		
Decatur	50,000	50,000
Kentucky		
Covington	1,400,000	
Louisville	4,000,000	5,400,000
Louisiana		
New Orleans	7,200,000	7,200,000
Maryland		
Annapolis	400,000	400,000
Massachusetts		
Lowell	2,700,000	2,700,000
Michigan		
Detroit	10,000,000	10,000,000
Nebraska		
Omaha	2,100,000	2,100,000
New York		
Buffalo	4,900,000	
New York City	18,000,000	
Schenectady	1,400,000	
Syracuse	2,500,000	
Yonkers	2,200,000	29,000,000
Ohio		
Cincinnati	8,000,000	
Cleveland	9,000,000	
Columbus	1,500,000	
Dayton	3,000,000	
Toledo	1,800,000	
Youngstown	3,600,000	26,900,000
Pennsylvania		
Allentown	1,350,000	
McKeesport	900,000	
Philadelphia	12,000,000	
Pittsburgh	10,000,000	
Scranton	1,000,000	25,250,000
South Carolina		
Charleston	900,000	
Columbia	800,000	1,700,000
Tennessee		
Memphis	1,000,000	1,000,000
Texas		
Austin	450,000	450,000
West Virginia		
Charleston	1,200,000	
Morgantown	270,000	1,470,000
	Total	$146,645,000

W. B. Clarkson

OWATONNA, MINN.—W. B. Clarkson, president of King Ventilating Company, died December 23.

Degree-Day Figures for December, 1937

HEATING & VENTILATING continues its tenth year of publishing degree-day data for various large cities

	Albany, N. Y.	Atlanta, Ga.	Baltimore, Md.	Birmingham, Ala.	Boston, Mass.	Buffalo, N. Y.	Burlington, Vt.
Degree-days for December, 1937.....	1126	659	841	603	1046	1149	1341
Degree-days, Sept. 1, 1937 to Dec. 31, '37	2423	1408	1704	1245	2192	2626	2930
Degree-days, Sept. 1, 1936 to Dec. 31, '36	2373	1099	1561	989	2161	2414	2981
Degree-days, Sept. 1, to Dec. 31, Normal	2439	1131	1664	913	2130	2372	2772

	Cheyenne, Wyo.	Chicago, Ill.	Cincinnati, Ohio	Cleveland, Ohio	Columbus, Ohio	Denver, Colo.	Des Moines, Iowa
Degree-days for December, 1937.....	1188	1188	1025	1081	1057	964	1255
Degree-days, Sept. 1, 1937 to Dec. 31, '37	2785	2576	2208	2397	2321	2114	2663
Degree-days, Sept. 1, 1936 to Dec. 31, '36	2803	2205	1927	2095	2031	2203	2379
Degree-days, Sept. 1, to Dec. 31, Normal	2888	2225	1784	2185	2020	2276	2370

	Detroit, Mich.	Dodge City, Kan.	Duluth, Minn.	El Paso, Tex.	Erie, Pa.	Evansville, Ind.	Fort Wayne, Ind.
Degree-days for December, 1937.....	1196	1029	1588	548	1112	939	1183
Degree-days, Sept. 1, 1937 to Dec. 31, '37	2691	2036	3735	886	2490	1914	2649
Degree-days, Sept. 1, 1936 to Dec. 31, '36	2432	1945	3746	1143	2190	1681	2288
Degree-days, Sept. 1, to Dec. 31, Normal	2332	1952	3434	1038	2163	1545	2220

	Fort Worth, Tex.	Grand Rapids Mich.	Green Bay, Wis.	Harrisburg, Pa.	Hartford, Conn.	Indianapolis, Ind.	Ithaca, N. Y.
Degree-days for December, 1937.....	585	1192	1371	1001	1050	1103	1124
Degree-days, Sept. 1, 1937 to Dec. 31, '37	1058	2676	3117	2139	2293	2379	2615
Degree-days, Sept. 1, 1936 to Dec. 31, '36	1018	2457	2922	1972	2184	2033	2497
Degree-days, Sept. 1, to Dec. 31, Normal	826	2397	2882	1981	2157	2002	2450

	Kansas City, Mo.	Knoxville, Tenn.	La Crosse, Wis.	Lansing, Mich.	Lincoln, Neb.	Little Rock, Ark.	Los Angeles, Calif.
Degree-days for December, 1937.....	1044	789	1375	1250	1138	682	115
Degree-days, Sept. 1, 1937 to Dec. 31, '37	2130	1688	3032	2900	2362	1378	240
Degree-days, Sept. 1, 1936 to Dec. 31, '36	1812	1304	2821	2708	2213	1206	265
Degree-days, Sept. 1, to Dec. 31, Normal	1809	1483	2778	2665	2201	1079	424

	Louisville, Ky.	Madison, Wis.	Memphis, Tenn.	Milwaukee, Wis.	Minneapolis, Minn.	Nashville, Tenn.	New Haven, Conn.
Degree-days for December, 1937.....	948	1366	696	1243	1460	794	991
Degree-days, Sept. 1, 1937 to Dec. 31, '37	1991	3023	1396	2768	3191	1652	2140
Degree-days, Sept. 1, 1936 to Dec. 31, '36	1740	2768	1233	2495	3031	1407	2050
Degree-days, Sept. 1, to Dec. 31, Normal	1587	2756	1127	2601	2941	1363	2109

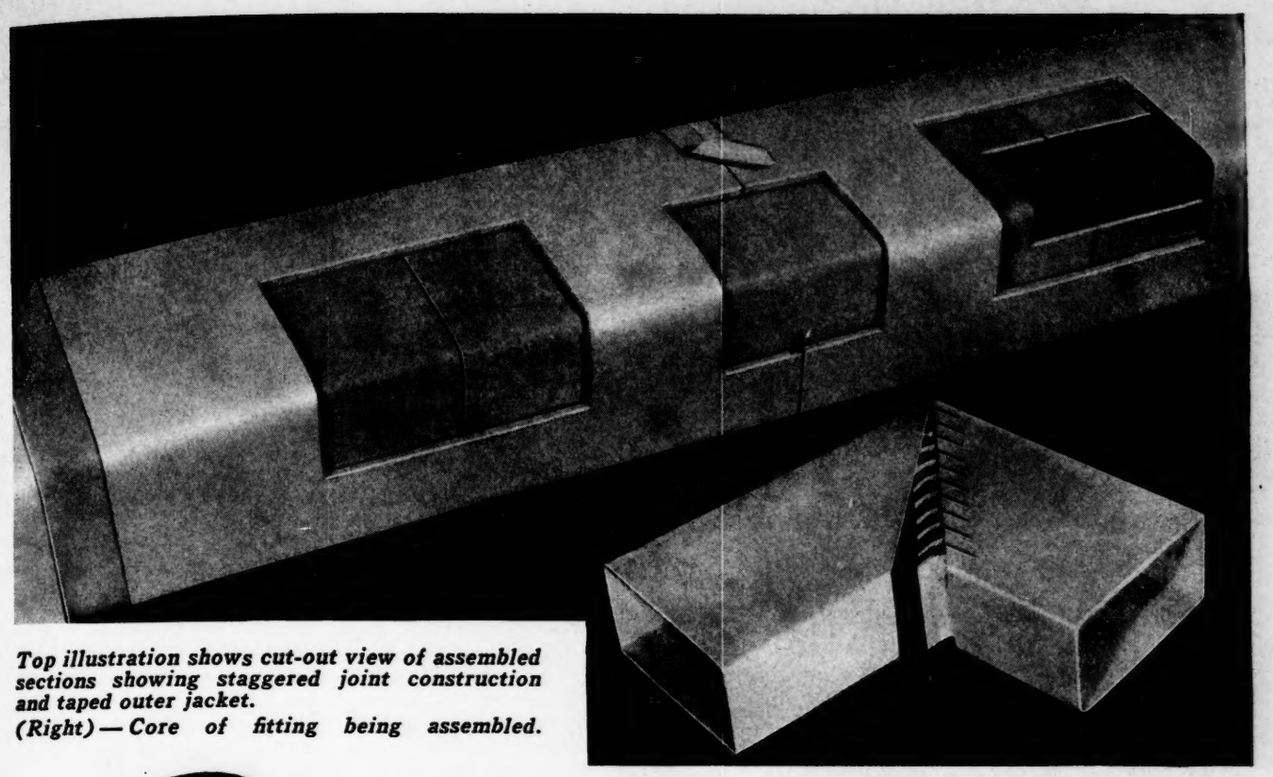
	New Orleans, La.	New York, N. Y.	Norfolk, Va.	Oklahoma City, Okla.	Omaha, Neb.	Peoria, Ill.	Philadelphia, Pa.
Degree-days for December, 1937.....	330	916	714	848	1178	1186	902
Degree-days, Sept. 1, 1937 to Dec. 31, '37	617	1916	1353	1616	2504	2580	1856
Degree-days, Sept. 1, 1936 to Dec. 31, '36	480	1783	1128	1447	2391	2191	1692
Degree-days, Sept. 1, to Dec. 31, Normal	403	1849	1195	1379	2284	2323	1735

	Pittsburgh, Pa.	Portland, Me.	Portland, Oreg.	Providence, R. I.	Reading, Pa.	Reno, Nev.	Richmond, Va.
Degree-days for December, 1937.....	1008	1179	652	1026	946	869	780
Degree-days, Sept. 1, 1937 to Dec. 31, '37	2241	2577	1385	2209	2010	1880	1651
Degree-days, Sept. 1, 1936 to Dec. 31, '36	1894	2571	1540	2133	1862	2157	1429
Degree-days, Sept. 1, to Dec. 31, Normal	1949	2496	1724	2129	2014	2284	1406

	Rochester, N. Y.	St. Louis, Mo.	Salt Lake City, Utah	San Francisco, Calif.	Scranton, Pa.	Seattle, Wash.	Spokane, Wash.
Degree-days for December, 1937.....	1140	1025	824	319	1083	620	958
Degree-days, Sept. 1, 1937 to Dec. 31, '37	2594	2050	1732	748	2422	1502	2220
Degree-days, Sept. 1, 1936 to Dec. 31, '36	2362	1702	2192	842	2251	1664	2560
Degree-days, Sept. 1, to Dec. 31, Normal	2414	1738	2149	949	2274	1881	2583

	Springfield, Ill.	Syracuse, N. Y.	Toledo, Ohio	Trenton, N. J.	Utica, N. Y.	Washington, D. C.	Wichita, Kan.
Degree-days for December, 1937.....	1110	1123	1153	959	1228	866	973
Degree-days, Sept. 1, 1937 to Dec. 31, '37	2336	2485	2576	2026	2681	1807	1945
Degree-days, Sept. 1, 1936 to Dec. 31, '36	1988	2357	2286	1892	2492	1616	1734
Degree-days, Sept. 1, to Dec. 31. Normal	2002	2491	2189	1760	2537	1741	1783

Methods of applying the degree-day in connection with the operation of heating plants or for the prediction of fuel consumption of heating plants are described fully in the DEGREE-DAY HANDBOOK, published in 1937, by HEATING & VENTILATING, 148 Lafayette Street, New York, price $3. Degree-days as given above for a "normal" month or season are based on averages for a long period of years, ending about 1922. Averages covering different periods will disagree with the above figures slightly.



Top illustration shows cut-out view of assembled sections showing staggered joint construction and taped outer jacket.
(Right) — Core of fitting being assembled.

Careyduct... The Standardized Prefabricated MADE OF ASBESTOS

INSULATED AIR DUCT

for modern Air Conditioning Systems

To keep pace with the great strides made in the improvement of air conditioning systems, the Carey Research Laboratory has developed "Careyduct" — an outstanding advance in the design and fabrication of air duct! Careyduct's many advantages include:

1. **INSULATED — Factory made insulated units insure uniform high efficiency in whole duct system.**
2. **FIREPROOF — Made of the everlasting mineral — asbestos.**
3. **REDUCES NOISE — The asbestos structure actually "hushes" fan noises — cuts down "speaking tube" effects.**
4. **LOW FRICTION — Smooth asbestos surfaces, close joints, and duct vanes in fittings reduce friction to equality with the best metal construction.**
5. **HIGH VELOCITIES — Velocities can be increased without noise, resulting in savings in cost and space.**
6. **PERMANENT — No rust, no decay.**

STANDARD SIZES

Standard sizes of Careyduct take into consideration wall thickness, so that two or more smaller sizes will exactly fit in and conform to a larger size. For example: an 11½" x 11½" duct can be joined with two 2½" x 11½" ducts and one 5½" x 11½" duct or two 5½" x 11½" ducts. This simplifies the making of branch connections and all fittings, one of the outstanding features of this standardized system of duct construction. Standard fitting accessories are supplied from factory or nearest warehouse.

Send for "Careyduct" book containing all the facts about this modern product. Address Dept. 49

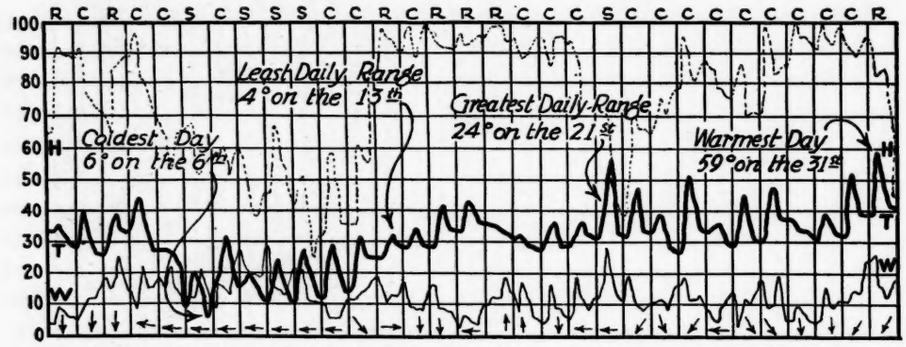
THE PHILIP CAREY COMPANY • Lockland, Cincinnati, Ohio

Dependable Products Since 1873

BRANCHES IN PRINCIPAL CITIES

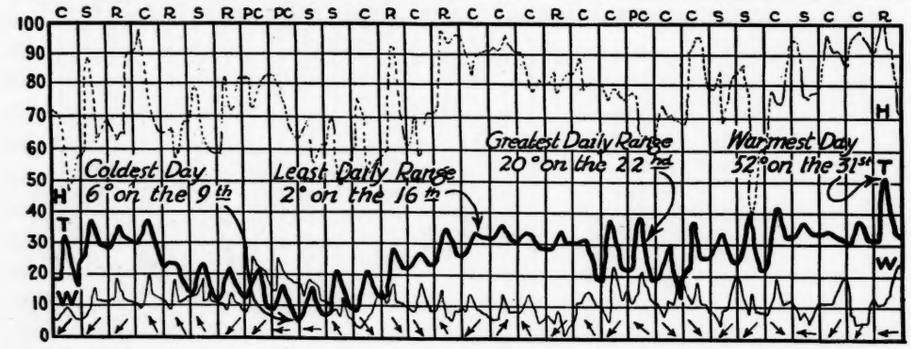
THE WEATHER FOR DECEMBER, 1937

Plotted from records compiled for HEATING & VENTILATING by the U. S. Weather Bureau. Heavy curves (T), dry bulb temperatures in deg. F.; dotted lines (H), per cent relative humidity from readings at 8 a.m., noon, and 8 p.m. Light lines (W), wind velocity in m.p.h. Arrows indicate wind direction at maximum velocity, north being arrow pointing up, etc.; S—clear; PC—partly cloudy; C—cloudy; R—rain; Sn—snow.



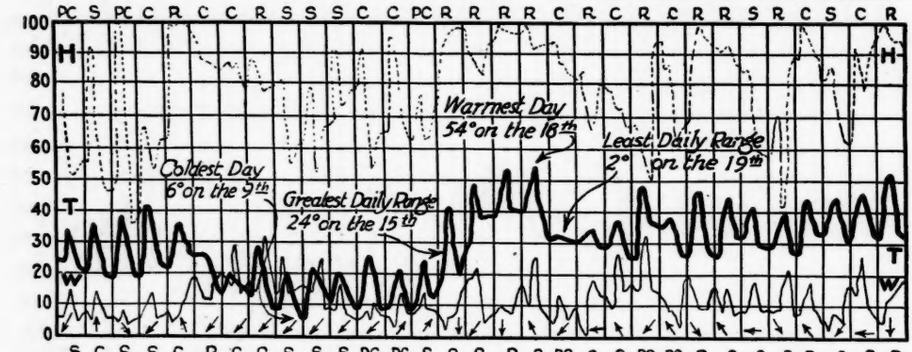
St. Louis

Mean temp. for month, 32.0F; aver. wind velocity, 11.5 m.p.h.; prevailing direction of wind, W.



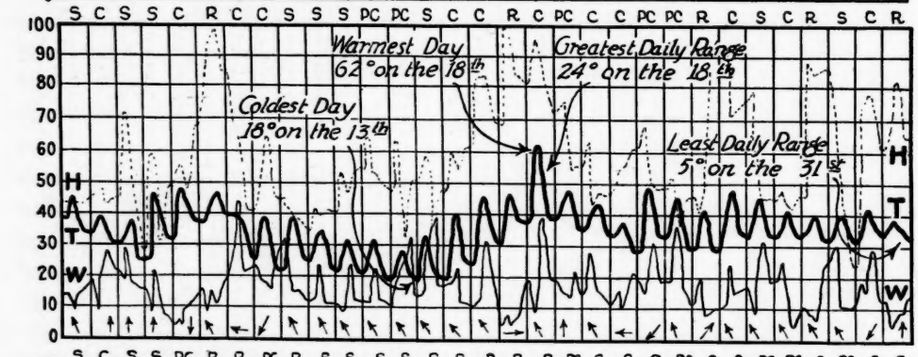
Chicago

Mean temp. for month, 26.6F; aver. wind velocity, 10.6 m.p.h.; prevailing direction of wind, W.



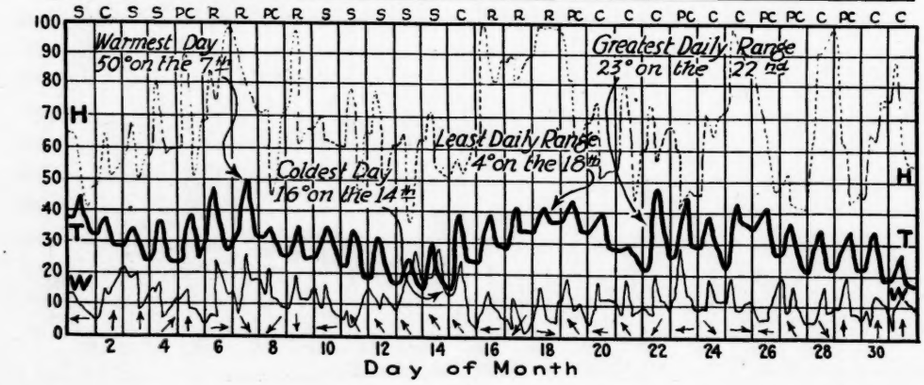
Pittsburgh

Mean temp. for month, 29.6F; aver. wind velocity, 10.3 m.p.h.; prevailing direction of wind, SW.



New York

Mean temp. for month, 35.4F; aver. wind velocity, 15.1 m.p.h.; prevailing direction of wind, NW.


Warmest Day
50° on the 7th
Greatest Daily Range
23° on the 22nd
Least Daily Range
4° on the 18th
Coldest Day
16° on the 14th
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Boston

Mean temp. for month, 31.2F; aver. wind velocity, 10.7 m.p.h.; prevailing direction of wind, NW.

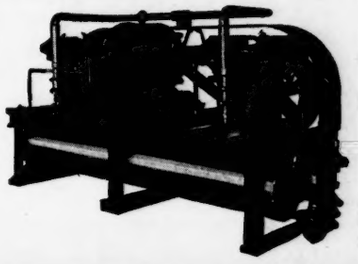
1 2 **3** 4 5 6 7 8 9 10 11 12 13 14 15

No. 3 of a Series of Curtis Advanced Engineering Features

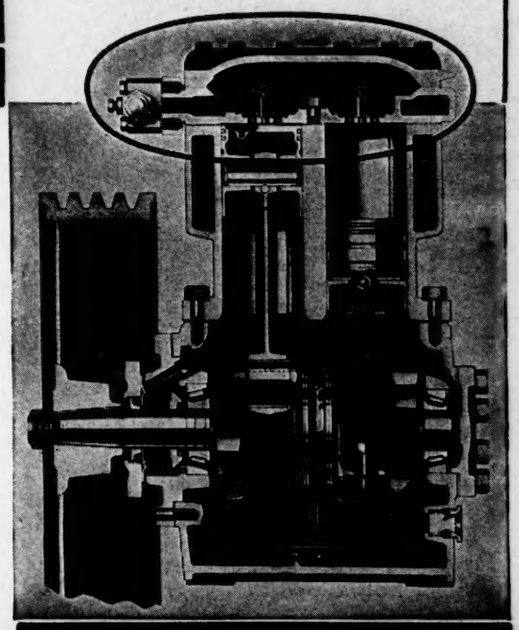
CURTIS DESIGN MAKES VALVE INSPECTION QUICK AND EASY

● The large removable chamber cover plate makes it unnecessary to disconnect gas lines for inspection of the discharge valves in Curtis compressors. This also acts as an expansion chamber, giving an even flow of refrigerant through discharge lines and assuring quiet, vibrationless operation.

This and other advanced engineering features of Curtis compressors have made the Curtis name recognized as a leader throughout the industry. In every phase of refrigeration and air conditioning thousands of Curtis units are delivering low cost, trouble-free service year after year.



Call your Curtis representative or write the factory for complete information.



CURTIS

"Builders of Condensing Units Since 1922"

CURTIS REFRIGERATING MACHINE CO.

Division of Curtis Manufacturing Co.

1999 KIENLEN AVENUE ST. LOUIS, MO.

Represented in Canada by
Canadian Curtis Refrigeration Co., Ltd.
20 George St., Hamilton, Ont., Can.

ANSWERING THE INDUSTRY'S *Most Pressing Problem* WITH A *New Type of Craftsman*

● One of the serious obstacles to the continued growth of your industry is the ACUTE SHORTAGE OF REALLY COMPETENT MEN for sales and making and servicing air conditioning and refrigeration installations. Furthermore, the incompetence of many now in the ranks constantly results in the defeat of your best-laid sales program, killing public desire for your wares, creating customer dissatisfaction, and in *financial loss to you.*

Only by effective training of men both upon a qualitative and quantitative basis can your man-power problem be solved and the success of your efforts be insured.

With these requirements in mind, the Refrigeration and Air Conditioning Institute of Chicago has moulded its Training Program so that the student is so grounded in theory that he actually thinks in terms of refrigeration and air conditioning, and so that he learns the service and installation of equipment by intimate contact with all conventional types in our laboratory, the only one of its kind, so far as we know, under the actual supervision of factory engineers.

This Training Program is planned to DEVELOP THE UNTRAINED, to teach the PRACTICAL APPLICATION of theory to the COLLEGE TRAINED MAN, and to PERFECT THE PRESENT TECHNICIAN. Thus it makes the benefits of a new profession available for men in all walks of life, and it broadens the source of man-power for your Industry, and gives to the Industry a new type of craftsman.

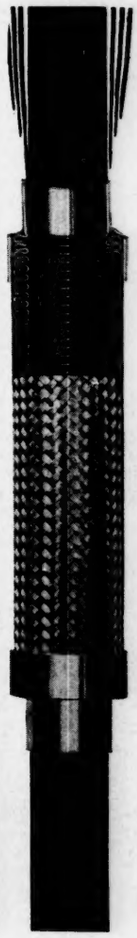
Mr. Employer, will you advise us of your requirements, so that we may be of service to you in solving your MAN-POWER PROBLEM?

More than 100 leading Manufacturers "officially" endorse and recommend this training program.

Ray A. Smith
PRESIDENT

REFRIGERATION & AIR CONDITIONING INSTITUTE

2130-2158 LAWRENCE AVENUE CHICAGO, ILL.



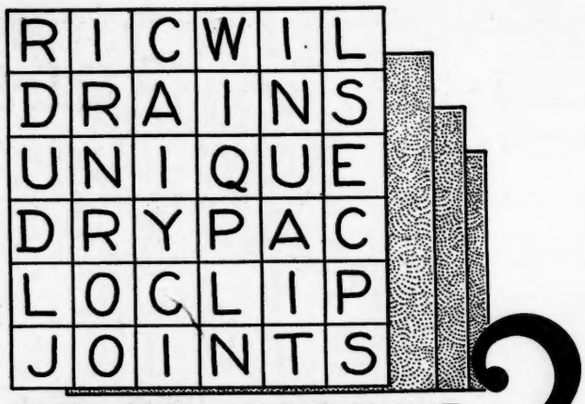
VIBRA-SORBERS

ABSORB VIBRATION, STOP NOISES IN COMPRESSOR PIPE LINES . . . ACT AS FLEXIBLE COUPLINGS FOR QUICK, TROUBLE-PROOF INSTALLATION . . . ALL SIZES.

Ask for

REX "VIBRA-SORBERS"

Made by
CHICAGO METAL HOSE CORPORATION
Maywood, Illinois



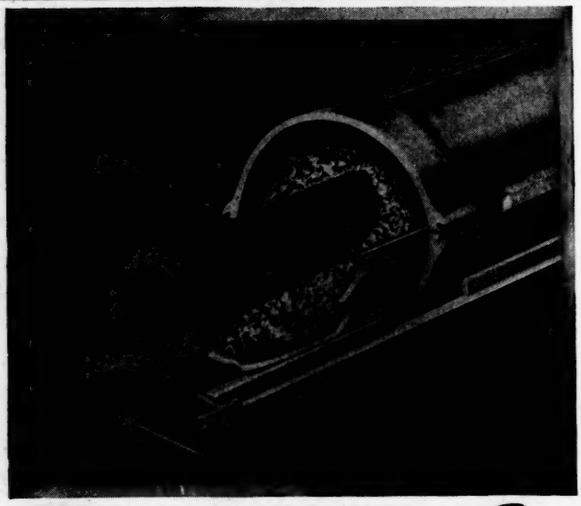
ONE-WAY PUZZLE?

You'll notice this "puzzle" reads across all right—but down, not so good. It's the same way with some underground steam conduit systems. On the surface they look O.K.—but when you go down into fundamentals they just don't make sense. Certain exclusive features in Ric-wiL design are vital to the successful performance of underground steam lines. Be sure you get genuine Ric-wiL with genuine Dry-paC asbestos insulation. That's a combination that reads right and is right—any way you look at it!

Ric-wiL offers the most dependable and successful underground conduit on the market. Various types in Tile and Cast Iron to meet every conceivable condition. A quarter century of experience with underground steam problems gives Ric-wiL engineers a decided advantage in serving YOU. Ric-wiL's basic features—closed construction, adequate drainage, Loc-liP side joints, special pipe supports, incomparable Dry-paC insulation, and many others—are essential to satisfactory performance. For genuine economy—get genuine Ric-wiL. Latest Bulletins on request.

The RIC-WIL Co., Union Trust Bldg., Cleveland, Ohio
New York San Francisco Chicago
Agents in principal cities

Ric-wiL is built by skilled craftsmen of long experience, on Ric-wiL products exclusively.



REGISTERED IN U. S. PATENT OFFICE

RIC-WIL

CONDUIT SYSTEMS FOR UNDERGROUND STEAM PIPES

ABSTRACTS

(Concluded from page 58)

pressure, using an electrically heated brass tube. These liquids are water, methanol, carbon tetrachloride, normal butanol, glycerol 26% by weight, kerosene, sodium sulfate 10% by weight, sodium chloride 24% by weight. [*"Heat Transmission from Metal Surfaces to Boiling Liquids," by D. S. Cryder and A. C. Finalborgo. Paper presented at the 29th semi-annual meeting of the American Institute of Chemical Engineers, Toronto, Canada, May 26-28, 1937. Paper reprinted from the Transactions of the American Institute of Chemical Engineers, Volume 33, No. 3. 24 pages; copy of paper may be obtained from the Secretary at 29 West 39th St., New York; price, 50c.*]

DUST CONTROL METHODS. An extensive medical and engineering study of the health of asbestos workers has been conducted by the United States Public Health Service. The material contained in this paper supplements the general study with a detailed study of the dust control methods used in an asbestos fabricating plant. It is a report on present conditions and how they have been obtained and is presented as an example of the results of the application of scientific methods of dust control. [*" A Study of Dust Control Methods in an Asbestos Fabricating Plant," by Richard T. Page, published in Public Health Reports, November 26, 1937, issue, pages 1713-1727. Copies for sale by Superintendent of Documents, Washington, D. C.; price, 5c.*]

BOILING. The state of the art of boiling is reviewed. With a submerged steam coil, it is found that at overall steam to liquid temperature differences of 30 to 50C, the "spheroidal state" develops, the liquid no longer maintains contact with the heating surface, and the rate of heat transfer decreases for further increase in temperature difference. Data are presented to show the significance of this effect in practical ranges for several organic liquids. [*"Boiling," by Thomas B. Drew and Alfred C. Mueller. Paper presented at the 29th semi-annual meeting of the American Institute of Chemical Engineers, Toronto, Canada, May 26-28, 1937. Paper reprinted from the Transactions of the American Institute of Chemical Engineers, Volume 33, No. 3. 24 pages; copy of paper may be obtained from the secretary at 29 West 39th St., New York; price, 50c.*]

INDUSTRIAL DUST. Increasing understanding of the role of quartz as the causative agent in silicosis has given rise to an insistent demand for better methods of determining the quartz content of dusts, especially in the presence of silicates. At present the available methods are more or less unsatisfactory from the point of view of their general applicability to routine analysis. In 1933, Knopf, in his paper on the quantitative determination of quartz in dusts, brought the subject up to date. Since that time other procedures have been developed or suggested. It is the purpose of this paper to assemble the material on methods for the quantitative determination of quartz in dust, to present it together with Knopf's method and to determine the present status of the question. [*"Method for the Determination of Quartz in Industrial Dust," by F. H. Goldman, published in the Public Health Reports, Nov. 26, 1937 issue, pages 1702-1712. Copies for sale by Superintendent of Documents, Washington, D. C.; price, 5c.*]

WITH THE MANUFACTURERS

The American Rolling Mill Co., Middletown, Ohio, announces that its president, *Charles R. Hook*, was elected president of the National Association of Manufacturers at the initial meeting of the Association's board of directors in New York recently.

Conco-Samsel Stoker Corp., Mendota, Ill., has named *Maurice J. Murray* assistant sales manager. Mr. Murray was formerly connected with the eastern sales division of Williams Oil-O-Matic Heating Corporation.

Crane Co., Chicago, has appointed *R. A. Hendrickson* manager of the oil sales section.

Domestic Air Conditioning Co., 20 Bartlett Ave., Highland Park, Mich., now four years old, recently opened its model two-story plant containing 12,000 sq. ft. of floor space. This is the fifth successive move of the company since its inception for the purpose of securing larger working quarters. A new corporation bearing the same name was incorporated about May 1 last year and acquired all of the assets of the old company and those of Heating Engineers, Inc. The manufacture of its own product Season-Aire was also started at this time.

The Fox Furnace Co., Elyria, Ohio, has appointed *Edward P. Hayes* general manager of sales succeeding George Boeddener, who recently resigned.

General Electric Co., Schenectady, N. Y., has named *D. W. McLenegan* manager of its Air Conditioning Institute, in Bloomfield, N. J. *R. D. Wood* will assist Mr. McLenegan.

The company has named *George Campbell*, manager of its local sales office in Schenectady, to the additional position of manager of the Syracuse office. The combined Schenectady and Syracuse territories include New York state and Susquehanna, Bradford, and Tioga counties in Pennsylvania, except the metropolitan New York and Buffalo area. Mr. Campbell succeeds A. J. Hornsby, who retired recently, in Syracuse.

Lamneck Products, Inc., Columbus, Ohio, has named *Kimball Burr* vice-president in charge of sales. Mr. Burr was formerly manager of American Radiator Company's air conditioning division.

Penn Electric Switch Co., Goshen, Ind., has opened a Philadelphia branch office at 4503 N. Broad St. *D. A. Coon*, formerly sales engineer in the company's New York branch, is in charge.

Trenton Auto Radiator Works, Trenton, N. J., has named *Borg Warner Service Parts Co.*, Chicago, exclusive export representative for its Kramer line of refrigeration and air conditioning equipment.

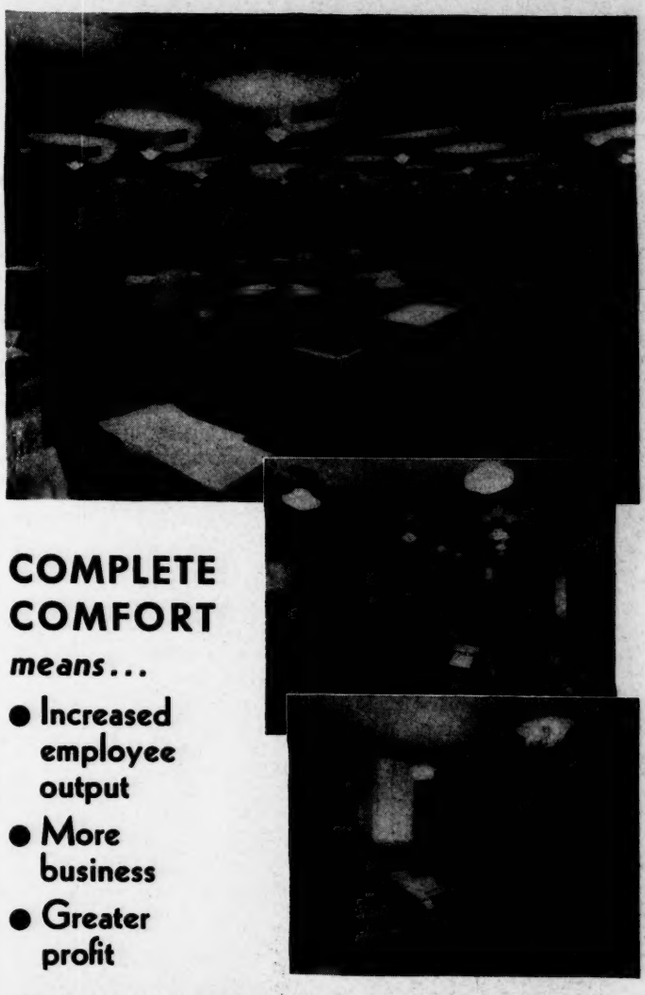
United States Steel Corporation of Delaware, 436 Seventh Ave., Pittsburgh, has appointed *Charles R. Moffatt* director of advertising.

Utica Radiator Corp., Utica, N. Y., has appointed *Macmann Engineering Co.*, Stamford, Conn., dealer for its washed air conditioners. *Hart Air Conditioning Co.*, Union City and Maplewood, N. J., has been appointed to handle the metropolitan Jersey territory. *Wallace*

These OFFICES

are examples of the great variety of business places successfully

AIR CONDITIONED BY CARBONDALE



COMPLETE COMFORT *means...*

- Increased employee output
- More business
- Greater profit

Carbondale air conditioning equipment has new and valuable capacity control features. A Carbondale engineer, backed by an organization with 37 years of experience in this field, will be glad to explain them to you... and to cooperate fully in the solution of your air conditioning problems. There is no obligation.

CARBONDALE
DIVISION
WORTHINGTON PUMP AND MACHINERY CORPORATION
General Offices: HARRISON, NEW JERSEY

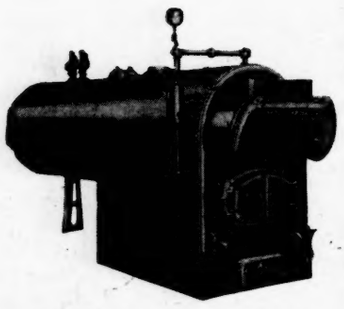
CA7-36 *Offices and Representatives in Principal Cities*

CARBONDALE

77 YEARS
OF PROGRESSIVE IMPROVEMENT
HAVE MADE THE
TITUSVILLE
LINE OF BOILERS
• MOST COMPLETE
• MOST EFFICIENT
• MOST ECONOMICAL

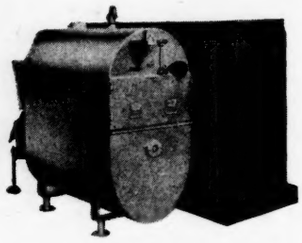
Made by one of the oldest and largest manufacturers of all-steel boilers, the Titusville line covers every known power and heating job from small residence boilers to giant water tube units.

Whatever may be your boiler requirement, you can depend implicitly on Titusville for time-tried dependability—for modern efficiency and economical operation. Your local Titusville Representative will be glad to cooperate with you.



For the modern, economical heat-power unit, inquire about the Titusville "RP" Portable Return Tubular Firebox Boiler line.

Titusville Series S-R Compact Type Heating Boiler with self supporting firebox.



TI-SCOT—the oil burning small residence boiler that has everything with 21 important advantages of design.

Special literature available on all types.

The TITUSVILLE IRON WORKS CO.
Division of Struthers-Wells Titusville Corporation
TITUSVILLE, PA.

Stebbins & Sons, Baltimore, have been named the company's distributor in Baltimore. Stebbins has appointed *P. M. Lockwood* to head its newly-organized air conditioning division. *Buckley and Scott Utilities, Inc.,* Boston, and *Buckley and Scott, Inc.,* Providence, R. I., have been appointed New England distributors for the company's air conditioners. *Williamson Heater Co.,* Cincinnati, has been named distributor in the Cincinnati territory. *Frank E. Kise,* in charge of the steam department, is taking charge of Williamson's air conditioning sales, and *G. W. Denges* will head the air conditioning installation department.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has appointed *R. A. McCarty* manager of the small motor division, with headquarters in Lima, Ohio. *F. H. Stohr* succeeds Mr. McCarty as manager of the generator division at East Pittsburgh. *R. F. Frenger,* whom Mr. McCarty succeeds, has returned to East Pittsburgh to the vice-president's staff for other special duties, following completion of the transfer of the company's small motor activities to Lima from Springfield, Mass.

NEW CATALOGS

(Unless otherwise indicated the publishers of catalogs will supply copies on request without charge.)

Heat Exchangers. A standard-size, 36-page bulletin, No. 200, on the Alberger line of heat exchangers including heaters for air, water, chemicals, and other liquids; coolers, vapor condensers, and reboilers. Bulletin describes the various commercial types and gives engineering data, dimensions and specifications. Also included is an alignment chart which makes it possible to determine the correct size of pipes for steam, condensate, and water. ALBERGER HEATER CO., 281-289 CHICAGO ST., BUFFALO, N. Y.

Tile Conduit. A revised, two-color, eight-page bulletin, No. 35-67A, on Adsco-Bannon tile conduit and Adsco-Corning filler insulation for underground steam or hot water lines, including illustrations of the products, details of construction and their application. AMERICAN DISTRICT STEAM CO., NORTH TONAWANDA, N. Y.

Pumps—Deep Well. Two standard-size, loose-leaf bulletins on deep well centrifugal pumps. Bulletin 265 covers deep well centrifugal pumps for industrial service, while Bulletin 1050 covers pumps for domestic applications. Describes the method of operation, features, and gives information on the method of selecting pumps. AMERICAN-MARSH PUMPS, INC., BATTLE CREEK, MICH.

Fans. A catalog entitled "Emerson Electric Fans for 1938," illustrating and describing desk fans, stand fans, ceiling, air circulators, ventilating and exhaust fans. Gives list prices, air delivery, and current consumption of the various fans.—THE EMERSON ELECTRIC MFG. CO., ST. LOUIS, MO.

Instruments—Outdoor Weather. A number of new catalogs covering outdoor weather instruments as well as Friez instruments for automatic control, indication, and recording of air conditions. Literature gives information on the following instruments: wind, humid-

ity, temperature, aerological, hydrological, hurricane recorders, lock level recorders, aircraft carrier wind systems, building display installations, and instrument accessories.—JULIEN P. FRIEZ & SONS, INC., BALTIMORE, MD.

Pumps — Vacuum and Condensate. A large size broadside on the Hoffman line of vacuum and condensate pumps. Gives information on the Hoffman Type B-C-D, E, R, S and U condensation pumps; also the vertical vacuum pump. HOFFMAN SPECIALTY CO., INC., WATERBURY, CONN.

Water Heaters.—A standard-size bulletin on instantaneous water heaters and heat exchangers for continuous hot water supply, circulation with storage tanks, hot water heating systems, and heated swimming pools. Gives information on Patterson instantaneous heaters, hot water service heaters, preheaters, condensate coolers, swimming pool heaters and convertors for heating systems. Also lists dimensions, capacities, and weights. —THE PATTERSON-KELLEY CO., INC., EAST STROUDSBURG, PA.

Rotary Ventilators. A standard-size, 20-page bulletin, No. 205, on the Swartwout rotary ball bearing ventilator. Gives details of construction, describes method of operation, and lists design and capacity information. THE SWARTWOUT CO., 18511 EUCLID AVE., CLEVELAND, OHIO.

Vent Pipe—Non-Corrosive. Bulletin 902 entitled "The Acid Test of Better Piping." Of special interest to heating and ventilating engineers is the description of the rectangular vent pipe and ventilating caps which are made of acidproof chemical stoneware. Sections of pipe are joined with "Flexlock" rubber joints which are made to grip the stoneware pipe. They are said to assemble easily and to form a tight joint which is under constant pressure. It is said that when inserted properly the pipe sections cannot be pulled apart.—THE UNITED STATES STONEWARE CO., AKRON, OHIO.

COMING EVENTS

MARCH 28-31, 1938. 8th Annual Forced Warm Air Short Course, Michigan State College, East Lansing Mich. Prof. L. G. Miller, Mechanical Engineering Department, Michigan State College, East Lansing, Mich.

APRIL 11-16, 1938. Mechanical Equipment Show, Textile Hall, Greenville, S. Car. William G. Sirrine, President, Textile Hall Corp., Greenville, S. Car.

MAY 31-JUNE 2, 1938. Annual Convention, Heating, Piping and Air Conditioning Contractors National Association, Boston, Mass.

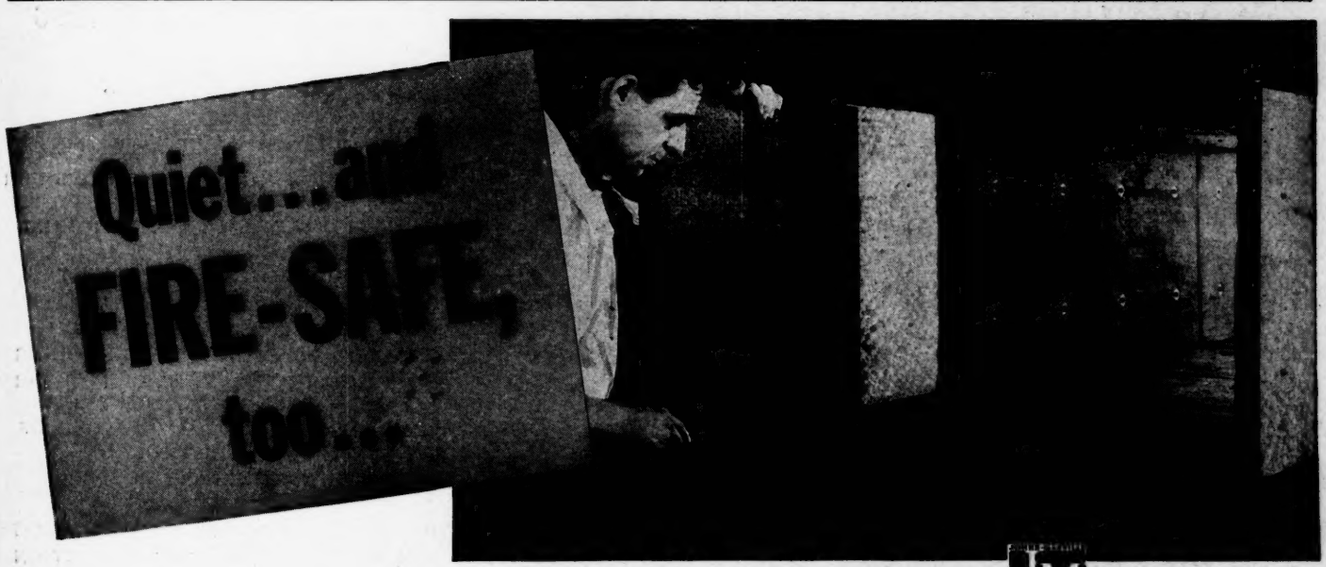
JUNE 20-22, 1938. Semi-Annual Meeting, American Society of Heating and Ventilating Engineers, Hot Springs, Va.

JUNE 20-24, 1938. 25th Spring Meeting, American Society of Refrigerating Engineers, The Pennsylvania State College, State College, Pa.

SEPTEMBER 21-23, 1938. 16th Annual Conference, National Industrial Advertisers Association, Cleveland, Ohio. Stanley Knisely, Advertising Manager, Republic Steel Corp., Cleveland, Ohio.

DECEMBER 5-10, 1938. 13th National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York.

JANUARY 23-27, 1939. Annual Meeting, American Society of Heating and Ventilating Engineers, Pittsburgh, Pa.



NO SMALL MATTER, the additional factor of fire-safety . . . when lining air-conditioning ducts for sound absorption! Bulletins from the National Board of Fire Underwriters report cases where expensive damage was caused by the absence of this protection.

To make sure *your* air-conditioning ducts will never contribute to fire spread, line them with Johns-Manville Airacoustic Sheets. This material has a rate of sound absorption as high as 80% . . . and provides a high degree of fire-safety as well.

Moreover, J-M Airacoustic Sheets provide many other advantages. Permanence, by virtue of their mineral composition . . . resistance to moisture . . . low thermal conductivity . . . light weight . . . and a smooth surface that means low frictional resistance.

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